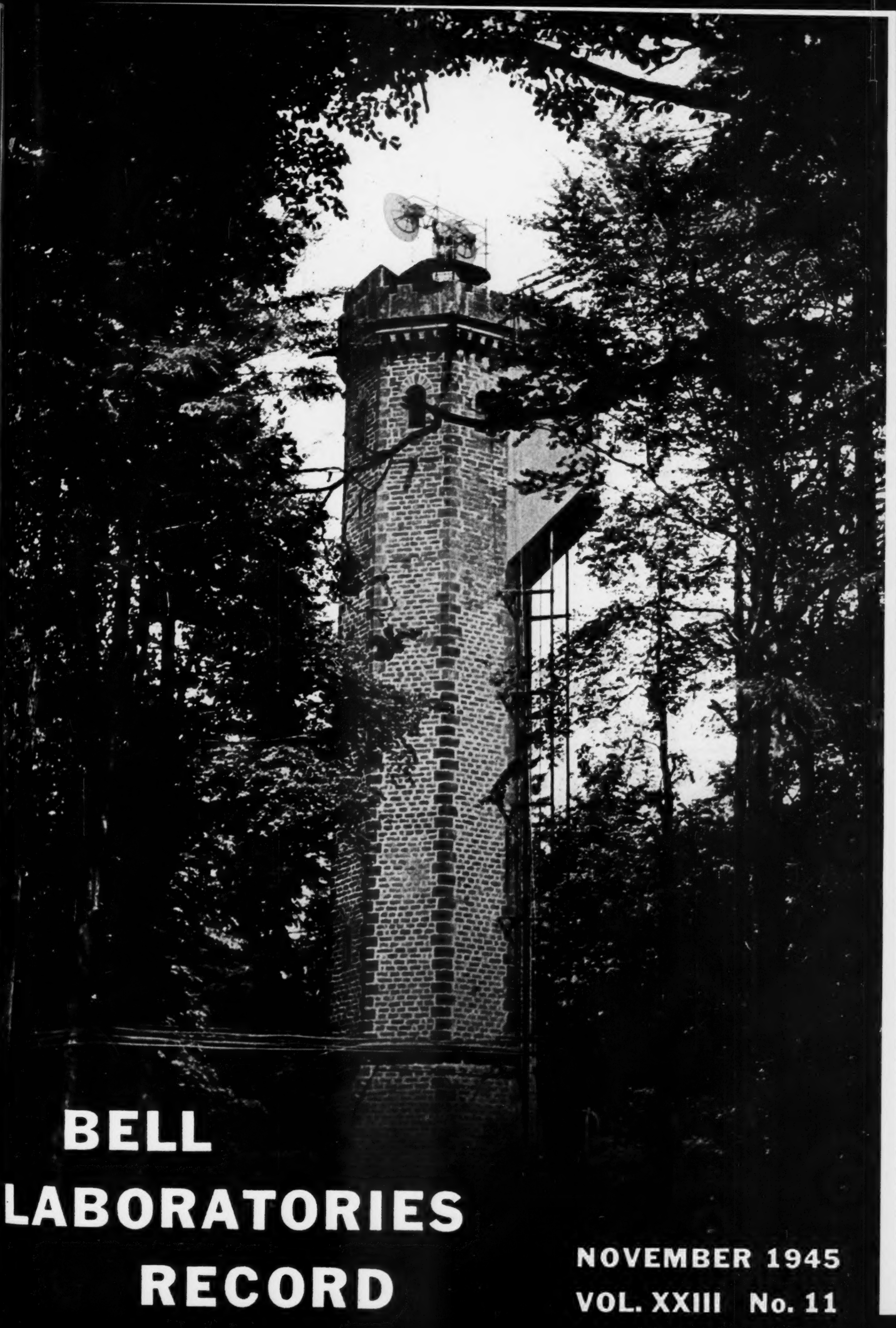

BELL LABORATORIES RECORD

NOVEMBER 1945
VOL. XXIII No. 11

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The Cover—On a tower at Heidelberg stood this AN/TRC-6 antenna, a part of the microwave radio-telephone system for the American Army.

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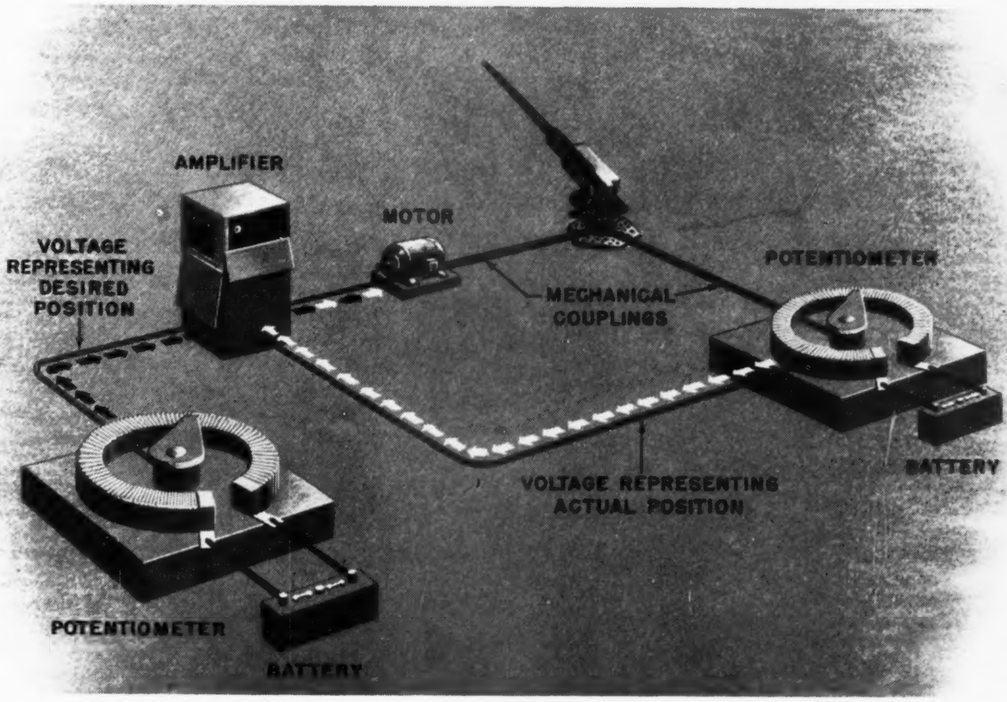


Servo-Mechanisms

By D. C. BOMBERGER
Physical Research

A GREAT many complex mechanical operations, in peacetime as in wartime, require power, speed, and accuracy beyond the capabilities of a human operator. Electric motors, and steam or hydraulic engines, can provide the power and speed, but something more is needed to provide accurate control of this power. There is a large and growing number of systems whose function is the accurate control of mechanical power; these systems are known as "Servo-Mechanisms."

Probably the earliest recorded use of the word Servo was by a Frenchman, Joseph Farcot, who in 1872 gave the name Servo-Moteur (literally, Slave motor) to an auxiliary motor on a speed governor for a steam engine. Somewhat later, the term was used in connection with the air engine from which power was derived to move the elevator or rudder of a torpedo. More recently, complete systems including servo motor and control have been called servos, or servo-mechanisms. They have been used for the automatic operation of machine tools; for control of heating and cooling systems; for pressure regulation in pumping systems; and for voltage and frequency regulation of generators. They are also used to steer ships and to stabilize them in heavy seas. The automatic pilot in an airplane uses several servos for the operation of the control surfaces. The larger airplanes have servo-operated controls even for manually controlled flight, so that the pilot has to work no harder than in flying a small airplane. The

applications of servos in war have been too numerous to list here, even if permissible.

The Bell System has used servos to a considerable extent, although not necessarily under that name. Western Electric radio transmitters, designed by these Laboratories, sometimes have a frequency-sensitive motor to adjust the transmitter's carrier frequency automatically. Just prior to the war, one group in the Laboratories was working on a method of graphical recording of voltage levels in communications equipment by a motor-driven stylus. This was a servo problem similar to those encountered in differential analyzers and other automatic computing systems. It was this similarity which suggested the possibility of an electrical director for anti-aircraft fire control; indeed, the brains of the M-9 Director are built into its servo system. Since the early days of the war, a great many other effective military devices, using servos of all kinds, have been developed in the Laboratories.

The design of servo-mechanisms in the Laboratories has been facilitated by years of experience with the electronic feedback amplifier used in communications, since servos and feedback amplifiers are similar in principle. A servo is a power-amplifying device in which the output power element, the servo motor, is actuated by the difference between the input and the resulting output. In general, the output power is large, capable of driving a heavy load. It is controlled by a relatively weak signal, amplified, and provided with energy from a power source analogous to the plate voltage supply in an electronic amplifier. Since the controlling signal is the difference between input and output, the net driving force is in effect the difference between what the signal says the motor shall do, and what it has actually done. This is, of course, the error in the system. The error signal must be properly poled so that the resulting output is in a direction to reduce the error. The motor is then constrained to do just what the input signal says it shall do, regardless of its own characteristic response to excitation.

The most important characteristic of a servo is the feedback of the output to insure accuracy. This method of control in an automatic mechanism is known as closed-cycle control. Its advantages may be appreciated by a comparison with the simpler open-cycle control. Suppose it is desired to aim a gun automatically, using an electrical motor. In an open-cycle system, one would determine how long the motor must be energized to turn the gun through a certain angle. This would constitute a calibration of the system. To turn the gun to a specified position, the motor would be energized for the appropriate length of time. Variations in the load on the motor through wear, changes in temperature, etc., disrupt the calibration of such a system, so that its accuracy would be questionable.

High accuracy, on the other hand, requires a closed-cycle control in which the calibration is permanent and precise. Some device is mounted on the gun itself which produces a voltage proportional to the angular position of the gun. This could be a potentiometer or voltage divider supplied by a constant voltage. Actual gun-laying systems use other means, but if it is assumed for the sake of simplicity that a potentiometer is used, then the calibration of the system is the determination of the volts on the moving contact of the potentiometer for a given position of the gun. This calibration could be made quite precisely, and would be permanent. In this system, the error signal used to drive the motor is the difference between an input voltage and the potentiometer voltage. The motor drives the gun until the error is reduced to a value which will not run the motor; and this value is made small by providing large amplification of the error signal.

To set the gun to a desired position, the signal voltage applied must correspond to the calibration of the potentiometer. If it is desired to move the gun continuously in order to keep it aimed at a moving target, a properly varying voltage is applied. An error larger than for a fixed setting will then result, the error being just large enough to drive the motor at the proper speed. In general, the higher the speed, the larger will be the error in this type of servo.

Various elaborations are used for reduction of the error in servos designed to generate motions. The servo described above will have the minimum error when setting up a fixed position; it is possible to add additional driving elements so that the minimum

error is obtained with either a fixed position or a constant tracking speed. Further addition of elements permits minimum error with constant rate of change of tracking speed, that is, constant acceleration, as well. This process may, in theory, be carried on indefinitely, but the system soon becomes too cumbersome to construct, and too difficult to stabilize.

The problem of stability in a servo is also quite similar to that in a feedback amplifier. Any feedback system has a tendency toward instability; that is, slight disturbances may cause a small oscillation about the proper output value, with the oscillation building up until the system is swinging wildly, completely out of control. It is somewhat like a man driving a car down a narrow road. There is a proper setting of the steering mechanism which will keep the car in the center of the road; a slight looseness of the mechanism, or a large hole in the road, will change the direction of travel slightly, requiring a steering correction. If the driver's reaction time is small, the error in direction will be corrected quickly, and the car will stay in the center of the road. However, a slow reaction time will permit the car to get well off its course before a correction is applied; the car will then head back toward the center of the road, and reach the other side. This process will continue until the car is in the ditch. The driver constitutes a link in the feedback loop of this system; evidently his abilities must be suited to the speed of the car, the sensitivity of the steering control, and the width of the road. Similarly, a servo-mechanism requires proper design of its constituent parts in order that the system be stable; in general, efforts to obtain greater accuracy of control increase the difficulty in maintaining stability. The methods of feedback amplifier design have been applied to servo design with considerable success.

THE AUTHOR: D. C. BOMBERGER received the B.S. degree in engineering from Lehigh University in 1934 and the M.S. degree in 1936. He then joined the technical staff of the Laboratories where, with the Wire Transmission Research Department, he worked on the development of the coaxial system. In 1937 he transferred to the Radio Research Department and worked on quartz crystals and related problems. With the beginning of our National Defense Program in 1940, he transferred to work leading to the M-9 Director and has been engaged in this and allied projects since that time.

Historic Firsts: Balancing Networks

EARLY in 1911 intensive research and development work was begun on repeater elements, repeater circuits, and on suitable lines for a transcontinental telephone circuit. Telephone communication had just been established between New York and Denver, but it was known that it would not be economically feasible to talk over longer loaded lines until a new or a greatly improved type of telephone repeater could be found to reënergize the attenuated speech. Also, it was realized that on a transcontinental line it would be necessary to use several repeaters in tandem, a feat not yet accomplished.

Repeaters so far had been of the 21 type,* using one amplifier for amplifying in the two directions. With such a repeater, speech arriving from either direction is amplified and sent out in both directions, and for satisfactory two-way operation, the impedance of the lines in the two directions should be closely alike. With non-loaded lines, this balance presented no serious difficulties, and as long as only one repeater was used, moderately good results could be obtained. The impedance irregularities of loaded lines, however, had made it impossible to secure a satisfactory balance between the lines on each side of the repeater, and it appeared unlikely that these irregularities could be reduced to sufficiently low values.

Recognizing this difficulty, Dr. G. A. Campbell, in a memorandum dated March 7, 1912, strongly recommended a trial of the not previously used 22-type repeater circuit on the basis of a theoretical prediction that with it the allowable unbalance in the lines would be about double that with the 21-type circuit. His comprehensive mathematical study of repeater singing phenomena reported May 14, 1912, fully supported his advance recommendations. With the 22-type repeater,† two amplifiers are employed to provide amplification in the two directions, and there are no requirements at all placed on the relative values of the impedances of the lines in the two directions, since separate artificial lines are used to provide the proper balance for each. With good balance between the lines and networks, moreover, a considerable number of repeaters can be used in tandem.

The various Campbell proposals, including the use of loaded artificial lines to balance the impedances of the real lines, were promptly considered by the development engineers. An initial study led to the conclusion, how-

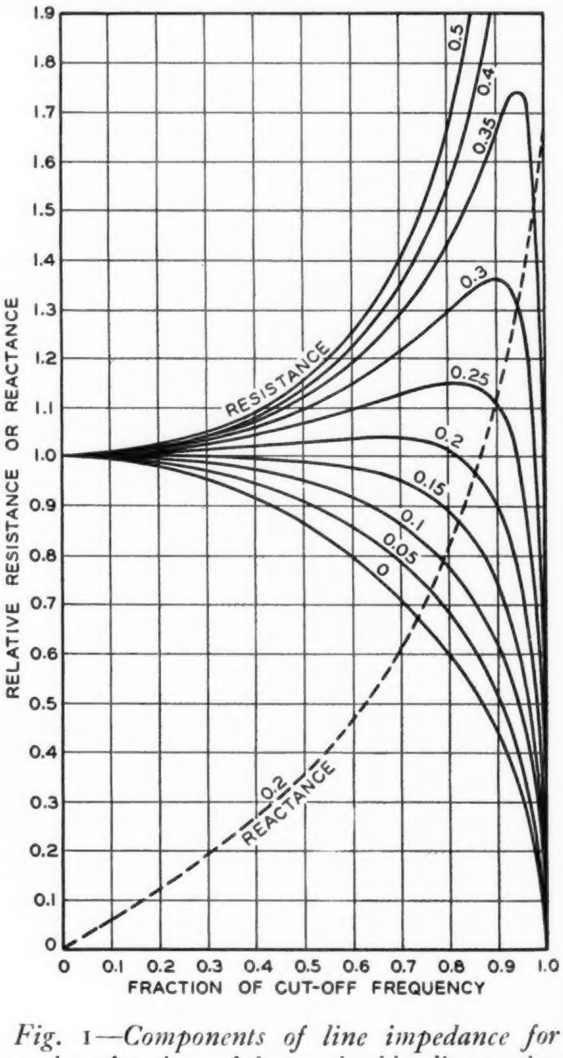


Fig. 1—Components of line impedance for various fractions of the terminal loading section

*RECORD, *August*, 1931, *page* 579; †*Loc cit.*

ever, that substantial expense and much difficulty would be involved in providing satisfactory loaded artificial lines.

The great need for a simpler type of balancing line was brought to the attention of R. S. Hoyt, who had just finished a very comprehensive theoretical study of the impedance of loaded lines. This study, reported June 7, 1912, included a determination of the impedance-frequency characteristics of a regularly loaded line as a function of its sending-end loading termination, and provided a complete theoretical background that enabled Hoyt to propose a simple three-element network which over the desired frequency range would satisfactorily simulate the impedance of a regularly loaded line at about 0.2 section, and which could easily be built out for any other desired terminations. This three-element basic network consists of a resistance to balance the resistance component of the impedance, and in series with it a parallel combination of inductance and capacitance to balance the reactance component. The various solid-line curves of Figure 1 show the resistance component of the line impedance for various fractions of the terminal loading section. It will be noticed that the curve for 0.2 loading section does not depart from a suitably chosen median value more than a small amount up to nearly 90 per cent of the cut-off frequency. It may thus be closely simulated by a fixed series resistance. The dashed curve shows the reactance component of the loaded line at 0.2 loading section.

Lines do not ordinarily terminate at 0.2 of a loading section, but Hoyt also suggested that when the line terminates at some other point, such as 0.5 loading section, the balancing network could be "built out" to this termination by another simple network. The complete balancing network would thus appear as in Figure 2. Since the network invented by Hoyt did not closely simulate the line impedance close to and above the loading cut-off, electrical filters* were employed to attenuate all frequencies above this value so that the poor balance at higher frequencies would have no ill effects.

In working out this basic network proposal for practical use, the choice of the optimum value of resistance was a comparatively simple matter. The derivation of formulas for the proportioning of the parallel inductance and condenser combination, however, involved a somewhat complicated

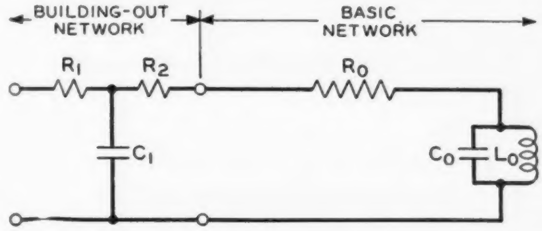


Fig. 2—The complete balancing network has a basic network and a building-out network

mathematical procedure which was recorded in Hoyt's memorandum of June 25, 1912. These formulas were used in the design of basic networks that were successfully employed in the first field trial of the 22-type repeater circuit, with loaded cable circuits, on September 6 and 7, 1912. When improvements in repeater elements reached a stage that warranted experiments with tandem repeaters, the 22-circuit was found to be satisfactory, and was exclusively used in the transcontinental project.

Patent No. 1,124,904 was granted to Mr. Hoyt for his 1912 basic network invention on January 12, 1915. A long series of subsequent patents covered improved forms of networks to extend the range of frequencies for which the balance applied, to take more accurately into account the effects of distributed inductance and dissipation in cables and lines, to provide for termination at various points of the loading section, and for balancing non-loaded lines.

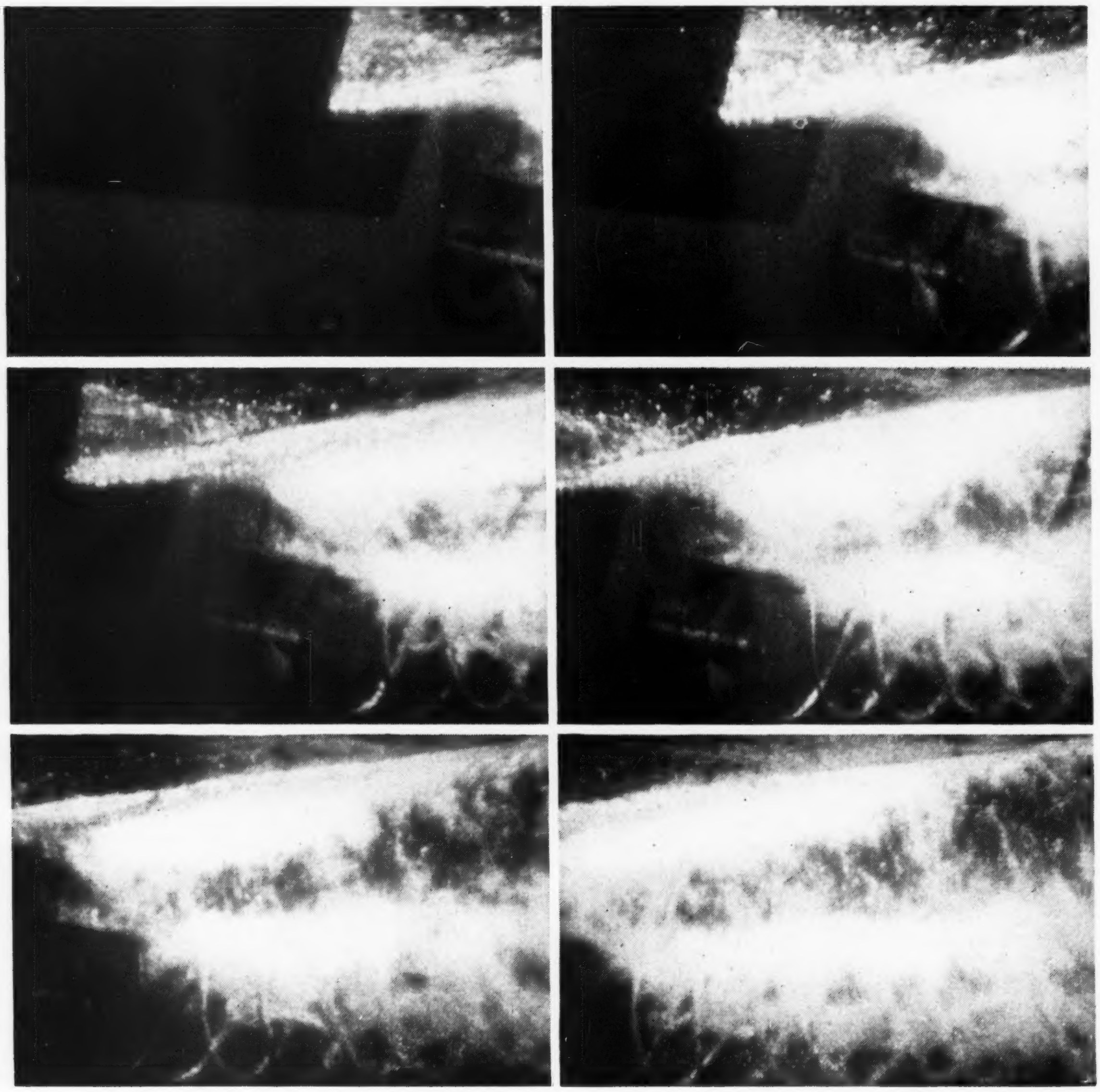
Hoyt's timely invention of the simple balancing network is credited with having made the 22-type repeater circuit practicable. During the third of a century since that time, the Hoyt type networks have become indispensable elements of standard two-way telephone repeater arrangements by virtue of their contributions to the high-grade repeater balance that is a fundamental necessity in such service.

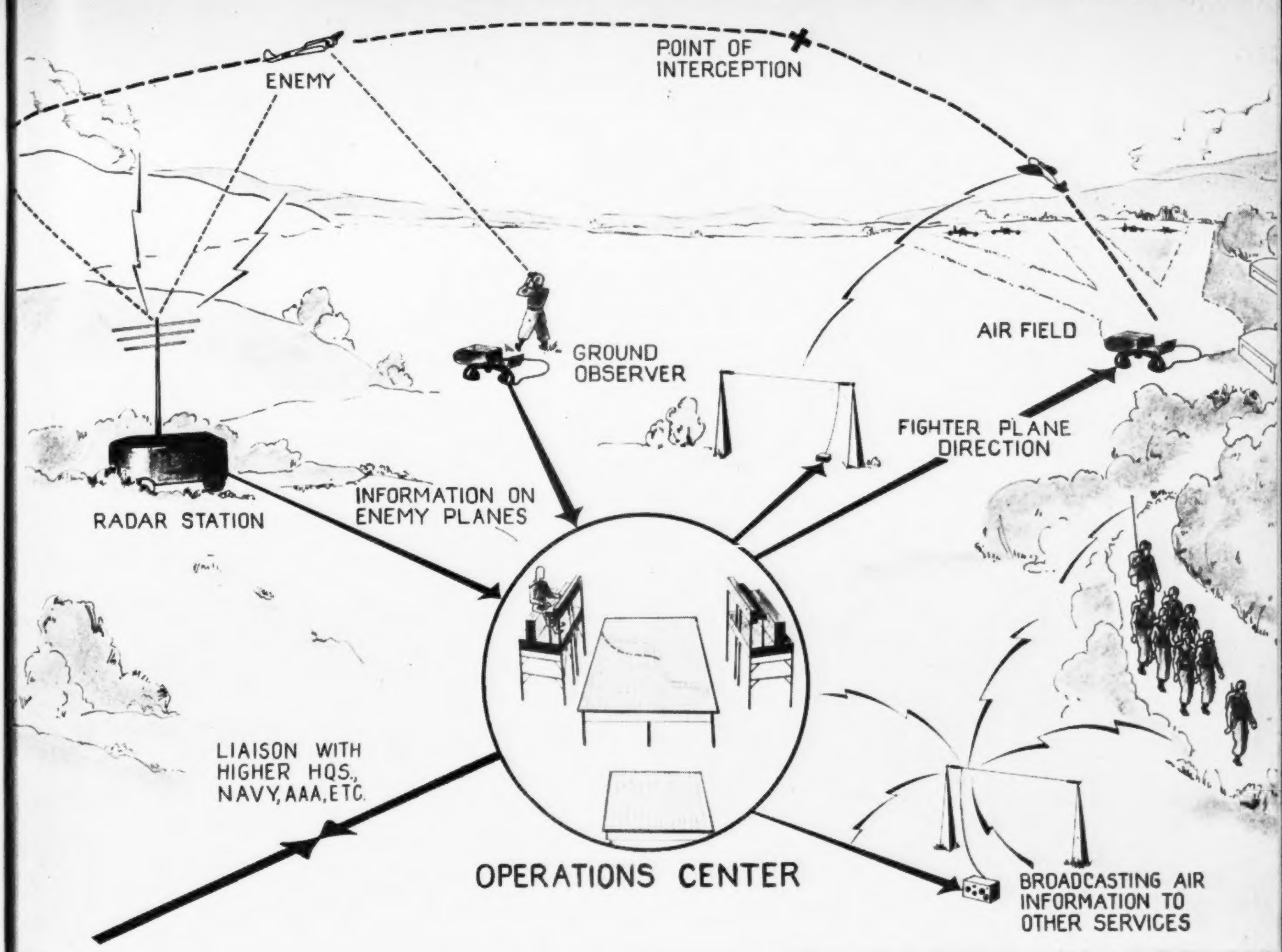
*Record, *August*, 1943, *page* 445.

High-Speed Movies Under Water

HOW cavitation takes place as an outboard motor drives a boat through the water is interestingly shown by a Western Electric "Fastax" camera taking pictures at 1,000 per second. The first three pictures show how the square stern of the boat produces a region of reduced pressure in which the air comes out of solution in the water to form bubbles. All but the first picture show how a spiral "tube" of reduced pressure is left behind by each propeller-blade tip. Air comes into these tubes from their walls, forming bubbles. There is no evidence of cavitation immediately behind the propeller.

These pictures were taken by J. H. Waddell of the Laboratories at Silver Springs, Florida. A "Fastax" camera was pointed through a glazed underwater port of one of the observation boats and pictures were taken at speeds up to 4,000 per second.





Combating Enemy Air Activity

By L. A. YOST
Switching Engineering

BEFORE the Pearl Harbor attack, an elaborate communications network with permanently located filtering and information centers* had been established along our seaboard to combat possible air raids. Thousands of airplane spotters located at suitable points reported all planes observed to the filter centers. Here the various reports would be checked against each other, the positions of the planes would be indicated on large maps, and suitable instructions issued to the various fighter commands.

The Army Air Force, which had been responsible for the development of the coastal system, also recognized that similar systems and centers would be required on the fighting fronts to control our tactical air forces. As a result, the Laboratories undertook the design of portable equipment along similar lines but modified to meet conditions on the fighting fronts. This equipment was known as the Information Center System SCS-5, and was used during the early stages of the war. Subsequently it was divided into units known as Operations Centers TC-15, which included half the equipment of the SCS-5.

The experience of the Army Air Force with this system indicated that the operating principles were sound, but that certain changes and refinements would be required to secure the fullest advantage, and a redesign was undertaken. In coöperation with the Laboratories' engineers, the Army Air Force set up the requirements, and during the early development stages discussions

*Record, *December*, 1941, *page* 87.

An AN/TTQ-1 portable operations center installed under a tent

were also held with the Navy and Marine Corps to insure that the equipment developed could be used by all the Armed Forces.

The development of the new portable operations center, called the AN/TTQ-1, had as its main objectives a reduction in size and weight to achieve greater portability and less effort in setting up or dismantling, and a simplification of the equipment to facilitate operation and maintenance. Since the equipment might have to be transported by cargo plane and set up in buildings with narrow doors and stairways, it was specified that no package should weigh more than 250 pounds nor be greater than 4 feet in any dimension, nor more than 2 feet in at least one dimension. To facilitate the stacking of the packages for shipment, no dimensions other than 1, 2, or 4 feet were to be used at all.

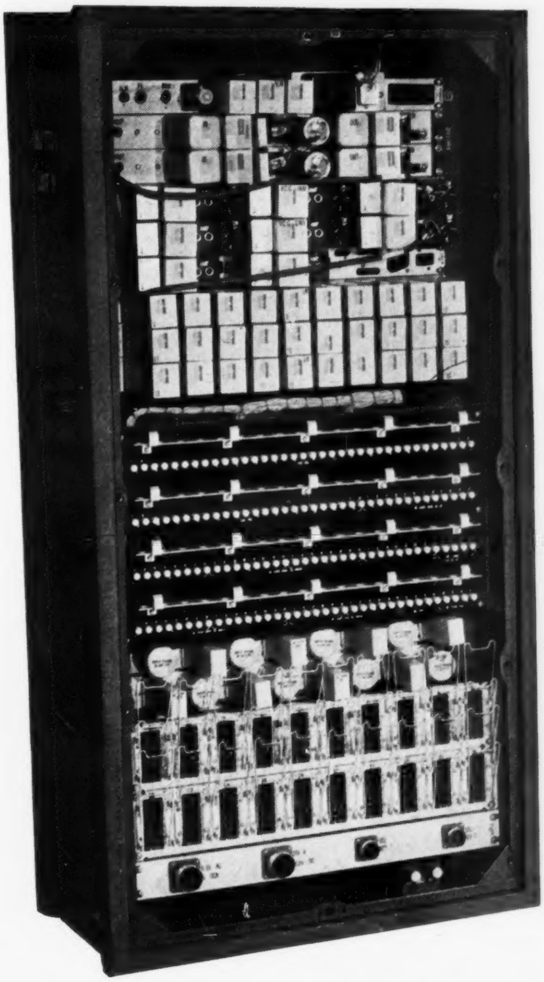
The Operations Center AN/TTQ-1 consists of communications equipment needed to receive and evaluate military information on aircraft for a geographical area, and to direct the action required by the information received. Information on all friendly and enemy aircraft in the area involved is received by telephone or radio and plotted on a large table map. Platforms carrying a bench and table are placed around the large map table for use of Air Force personnel, who can watch the activities indicated on the table maps, pass information to other interested military agencies, and order the proper action to be taken. Since such procedures involve fighter planes, radio contact must be maintained from the Center to planes in flight. In addition to air warning and fighter-control functions, the Marine Corps and Army Ground Forces have found this equipment useful in anti-aircraft artillery control. In a great many cases, the equipment will be located in a building or under a tent, so it was arranged to mount

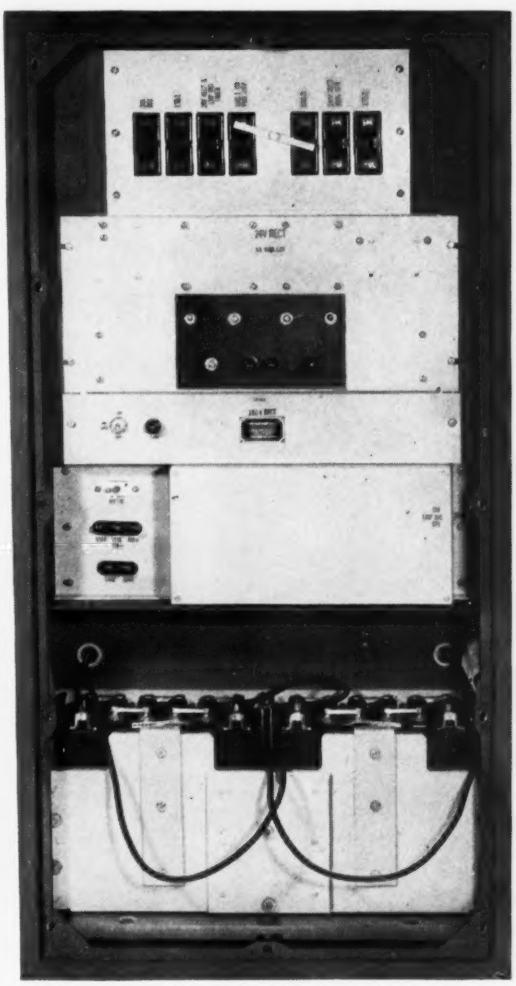
A complete AN/TTQ-1 center arranged for transportation on an Army truck

the platform positions and cabinets in 2½-ton Army trucks for use as mobile Centers.

Many problems, both in circuit and equipment design, had to be solved in meeting the requirements laid down. A minimum of apparatus is used in the circuits, not only in the interest of keeping weight down but also for ease in maintenance. The line circuit, for example, contains only a single relay which functions as a ring-up and lock-up relay. Since this equipment had to work with a variety of Signal Corps sets, many of which were not designed to be controlled from a remote location, it was necessary to design a radio-channel control circuit that was universal in character. This circuit contains only a single relay, but has a large number of contacts and binding-post facilities to permit a variety of ways for connecting to remote radio sets. The telephone portion of the equipment consists of only two types of telephone sets: a handset and a head-chest set. Two types of units are provided to work with these telephone sets at each of the operating positions: one is a telephone unit and the other a line unit. A relay cabinet houses the line relay and radio control equipment, and the power cabinet contains the storage batteries, rectifiers, and circuit breakers.

The position telephone unit may be considered as equivalent to the bell box at a subscriber's station and is about the same size. A telephone unit and a handset or head-chest set are required for each operating position. The line unit, which is the same size as the telephone unit, is equipped with five jacks and lamps. These position units can be readily fastened or unfastened at an operating position without the use of tools. The requirements for any position can, therefore, be met by using as many of the position units as the situation demands. Three tele-





Relay cabinet (left) and power cabinet for the portable operations center

phone units, for example, may work with a single line unit, or a single telephone unit may work with four line units. Connection between a line unit and a relay cabinet is made by flexible multi-conductor cables through plugs and sockets. Outside connections are made to binding posts on the relay cabinets, which also contain the necessary protective equipment.

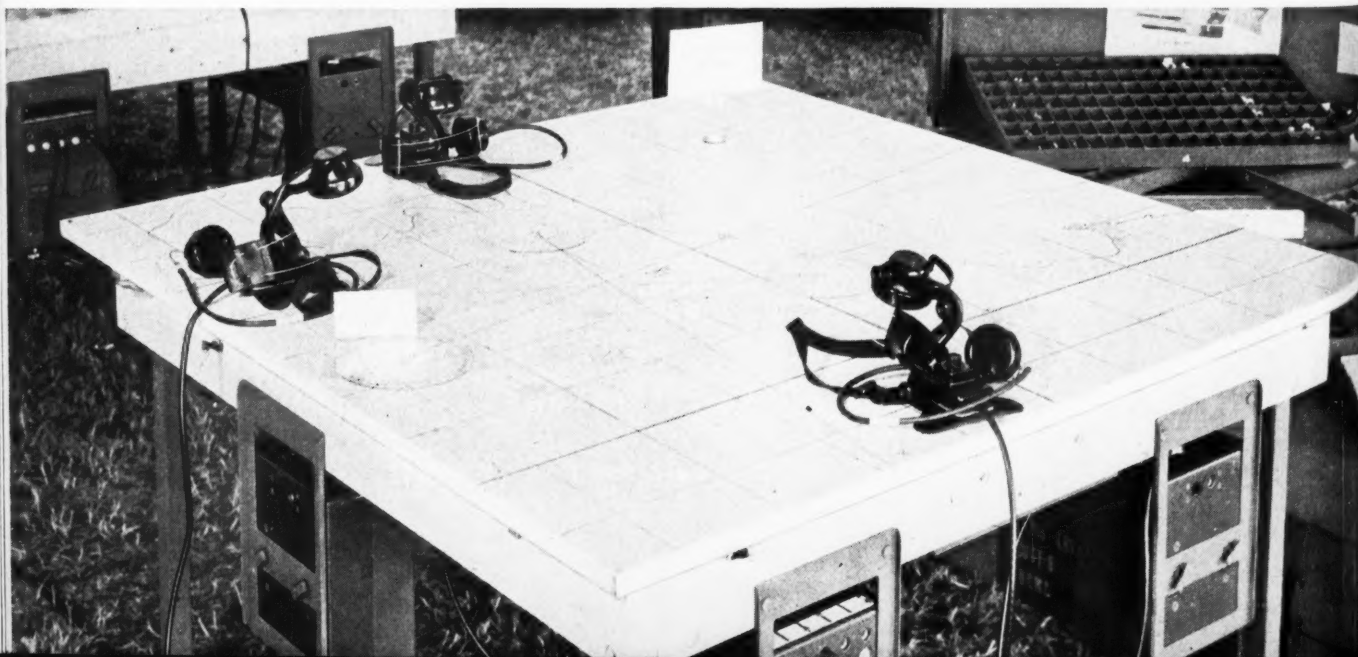
In addition to the above equipment, engine alternator sets are supplied, since commercial power is usually not available or is inadequate. Power for the communications equipment and a portable lighting system, which is also included, is transmitted over flexible cables through plugs and sockets.

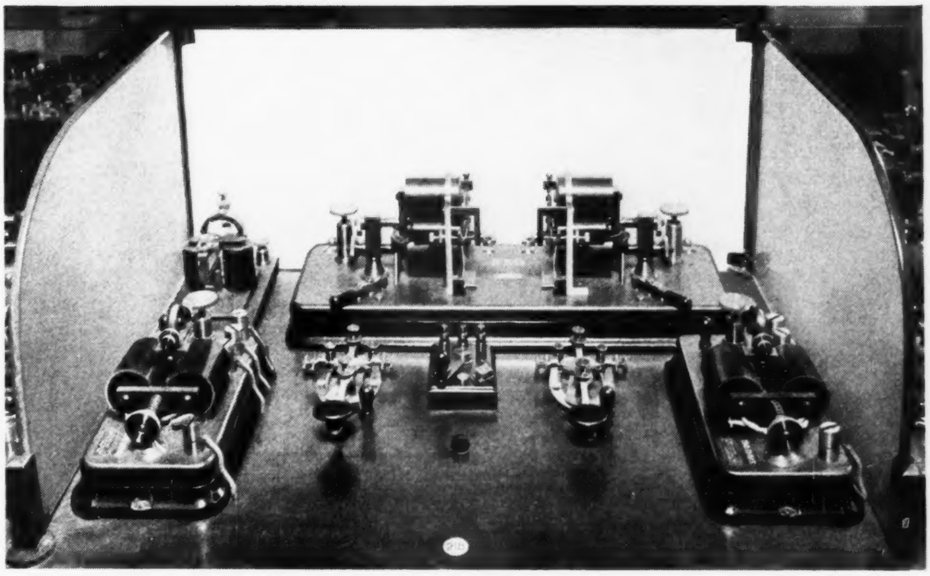
In addition to the development of circuits and equipment, considerable attention was given also to the design of the packing cases. To reduce the amount of wood employed and still secure adequate strength, half-inch plywood was used throughout. Bolted construction is employed to simplify packing and unpacking, and some of the cases are designed to open up to form platforms and others to form tables. Every case will fulfill some function in a complete system. The cases were designed so that so far as weight limitations would allow, each would be completely full of equipment, thus saving space and avoiding movement of the various elements within each case. The success attained by these various efforts is evidenced by the fact that the complete AN/TTQ-1 equipment consists of 24 cases and weighs a little over three tons, while the TC-15 equipment required 41 cases and weighed a little over six tons.

The equipment as shipped from the Western Electric Company is complete in every detail, and needs only gasoline and oil for the engine alternator, a shelter, and personnel for its operation. The assembly also includes plotting and drafting material, maintenance tools, spares for the more fragile or expendable parts, and assorted prosaic items such as nails, screws, and a hammer and saw.

THE AUTHOR: L. A. YOST received the degree of B.S. in E.E. from Purdue University and at once joined the Western Electric Company at Hawthorne, where he took the long-term student course. In 1927 he transferred to the Kearny works, and in 1931 to the Department of Development and Research of the American Telephone and Telegraph Company. Here he was a member of the Equipment Development Department, and continued similar work after the transfer of the D and R to the Laboratories in 1934. His work was chiefly concerned with manual central-office switchboards, and since Pearl Harbor he has been engaged in developing equipment for information centers for the Armed Services.

One of the tables of the AN/TTQ-1 showing two telephone units, left and right, and a line unit, center. The case at the extreme right carries drafting materials and the markers used on the tables





Single-Line Telegraphy in Early Bell System Practice

By B. P. HAMILTON
System Development

FOR the first telegraph services of the Bell System, a very simple telegraph circuit was used as illustrated in Figure 1. A single-line wire was equipped at each end with a telegraph set containing a relay, sounder, and key. The sets were generally connected to grounded batteries of different polarity. As each telegraph key contained a short-circuiting switch, the circuit was normally closed, and current flowing over the line kept both relays in the operated or "marking" condition. Because the operation of the relay was independent of the direction of the current through them, such a system was called a "neutral" system* to distinguish it from a "polar" system in which the direction of operation of the relays is determined by the polarity or direction of the current through their windings. This simple system was also referred to as a "Single Line" or "Single Morse" system.

When an operator wishes to communicate over this circuit, the switch at the telegraph key is first opened. This stops the flow of current, and the relays are moved to their released or "spacing" positions by springs connected to their armatures. Then the circuit is ready for the transmission of signals by the rapid closing and opening of the telegraph key, which imparts a similar movement to the relays and associated sounders. It will be noticed in Figure 1 that a two-wire loop was employed between the subscriber's premises and the central office. There are several reasons for this. In the first place, two wires were always available, since at times the loop might be used for telephone service; also, a two-wire line is preferable because it is balanced with respect to an adjacent pair, and less interference results; and finally, it was more satisfactory to supply sending battery from the central office rather than to maintain a separate battery at each subscriber's premises. A local battery was necessary for operating the sounder, but this required only a few cells, of either the wet or dry type. At a somewhat later date, power was taken from the commercial lines, which in this general period were d-c.

Line wires which are being used for telegraph services, as illustrated in Figure 1, cannot be used at the same time for telephone service, and since the Bell System's interest

*Present-day "neutral" systems employ polar relays because of their superior characteristics, but in other respects the systems are "neutral."

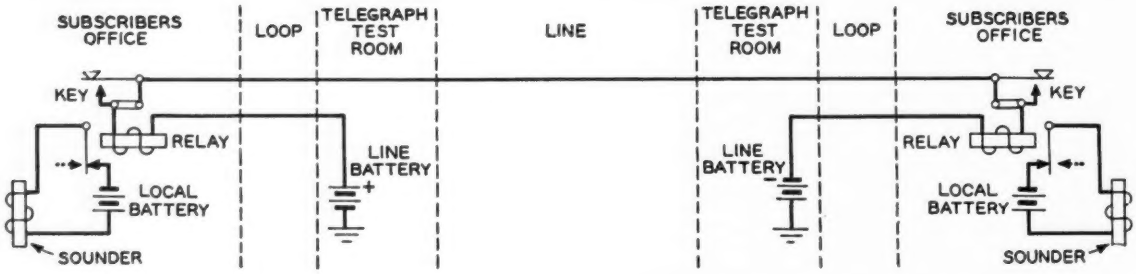


Fig. 1—A single-line telegraph system transmits "open and close" signals over a single wire and ground return. A two-wire loop is used between the subscriber and the central office

was chiefly in the telephone, the withholding of lines from telephone service was not regarded very favorably. What was desired was some method of imposing both telegraph and telephone signals on the same line wires at the same time without mutual interference. If such a system could be made available, the rapid expansion of the wire plant for telephone purposes would automatically provide plenty of lines that could be used for leased-wire telegraph service.

As early as 1887, experiments were being made of various methods of accomplishing this end, and the first system to be employed was known as the simplex system. It was used commercially between New York and Philadelphia in 1888. In its first used form, this circuit was arranged as shown at A in Figure 2. At each terminal an inductance coil is bridged across the line, and the telegraph circuit is connected to the mid-point of this coil. This results in a Wheatstone bridge type of circuit with the telegraph and telephone circuits connected at conjugate points so that neither has any effect on the other. The bridge nature of the circuit is brought out more clearly in Figure 3, which is identical electrically to Figure 2A but is drawn differently. If the two halves of both the east and west inductance coils have equal impedance and the two sides of the line have equal impedance, then regardless of the value of voltage impressed across points A and D, there will be no potential difference between B and F or between C and E. As a result, telegraph voltages, which are applied between A and D, will have no effect on the telephone circuits at the two terminals, since these connect to points B and F and C and E. Similarly, any voltages impressed across B and F and across C and E will produce no potential difference across A and D, and thus will have no effect on the telegraph circuits.

Although this form of simplex circuit avoids interference between the telephone and telegraph currents, it impresses the telegraph voltages, which may be as high as 130 volts, on the telephone terminal equipment. To avoid this, the inductance coil was replaced by a transformer as shown at B in Figure 2. The overall effect of this circuit is the same as that at A except that the telephone

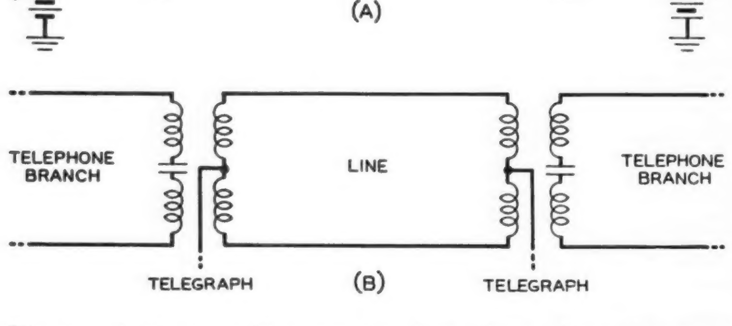


Fig. 2—A telephone line may be adapted for telegraph transmission without mutual interference by use of a center tapped induction coil, as at H, or a transformer with center tapped secondary, as at B

apparatus is isolated by the transformer from the telegraph voltages. Although this circuit had been known and used to some extent for several years, it had apparently not been possible until about 1900 to manufacture a transformer with sufficiently good balance to give entirely satisfactory results in service.

When simplex transmission is used, each telephone pair provides but one telegraph channel. Shortly after the first form of simplex circuit came into use, however, the composite circuit* was developed. This permits a grounded telegraph circuit to be derived from each of the two wires of a telephone pair, and does this without interfering with the use of the telephone circuit as one side of a phantom circuit. The arrangement is shown in Figure 4. It was first used for service in the Bell System during an emergency caused by a sleet storm in the spring of 1891. It was used for regular service in 1892, and by 1896 a Bell System standard composite set had been developed and put into use.

While the simplex circuit prevents the telegraph signals from interfering with telephone transmission by balancing the two sides of the circuit, the composite set avoids it by separating the telephone and telegraph currents by simple filters at the central office. These currents may be separated because of the difference in the essential frequencies required for telephone and telegraph communication. The action of the filters may be seen a little more clearly by redrawing Figure 4 as shown in Figure 5. The coils and condensers in the telephone branch readily pass the higher frequency telephone currents, but block the lower frequency telegraph currents, while the coils and condensers in the telegraph branch do just the reverse; they block the higher frequency telephone currents, but readily pass the lower frequency and d-c telegraph currents.

*Record, *December*, 1928, *page* 140.

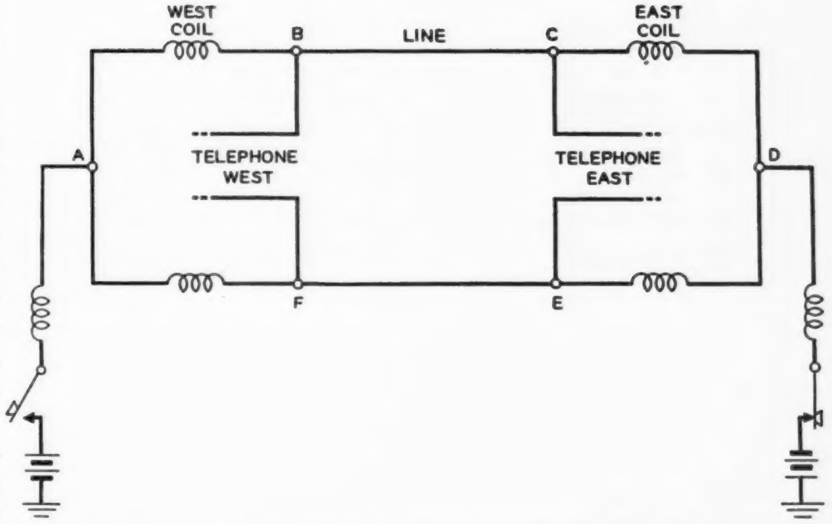


Fig. 3—A simplex circuit creates what is essentially a Wheatstone bridge, with telegraph and telephone signals supplied at conjugate points. This circuit is electrically the same as that shown in Figure 2A

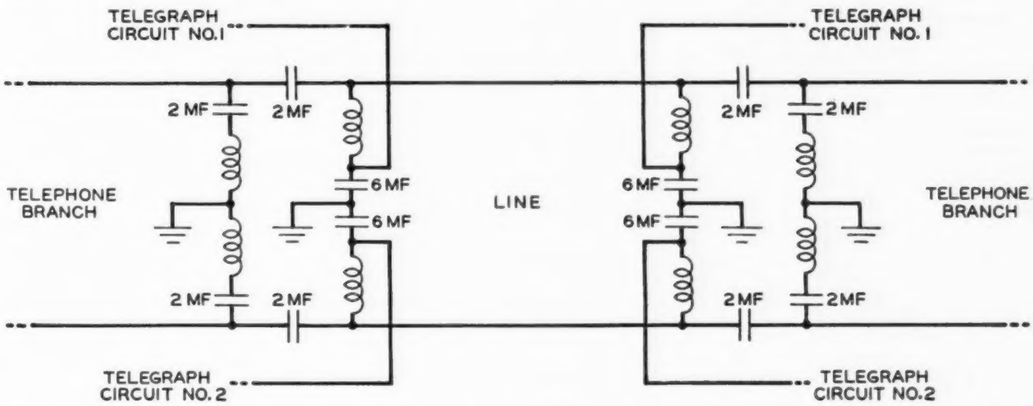


Fig. 4—By using composite coils, a single telephone circuit can provide two telegraph channels with no mutual interference

Although the composited circuit provided two telegraph channels per pair of line wires instead of the one of the simplex circuit, it made it impossible to employ the usual method of telephone ringing because the lower-frequency ringing current, 16 or 20 cycles per second, would be blocked by the series condensers in the telephone branch if it were applied at the office side of the composite set, and would interfere with the telegraph circuits if it were applied at the line side. It was necessary, therefore, to use one telegraph channel as an "order wire" over which the distant office would be notified by telegraph of the various telephone connections desired. This was known as the Morse Ticket System. It was not without its advantages since it saved a certain amount of telephone circuit time. In special situations, it has continued in use to the present time, but its general use was abandoned with the development of the successful composite ringer in 1902. With this device, the 16-cycle ringing current operates a relay that applies 135 cycles to the line. At the receiving end an a-c relay, mechanically tuned to 135 cycles, is operated by this current, and in turn connects 16-cycle ringing current to the local telephone circuit. The 135-cycle current is high enough in frequency to follow the telephone path through the composite set and to be sufficiently suppressed in the telegraph branch.

On the earlier telegraph circuits no telegraph repeaters were employed because of the short distances involved. It soon became apparent, however, that repeaters would be required to renew the current at intervals along the line, and as a result the single-line repeater was adopted. It was first used in Pittsburgh on a New York-Chicago circuit, and was standardized in 1893. An improved single-line repeater developed by the Bell System was made available for commercial service in 1904. It was a "direct point" repeater: a relay receiving from one line transmits directly to the next line by means of its own armature and contacts, thus avoiding the use of any separate local transmitting circuit. The essential elements of this repeater are shown in Figure 6.

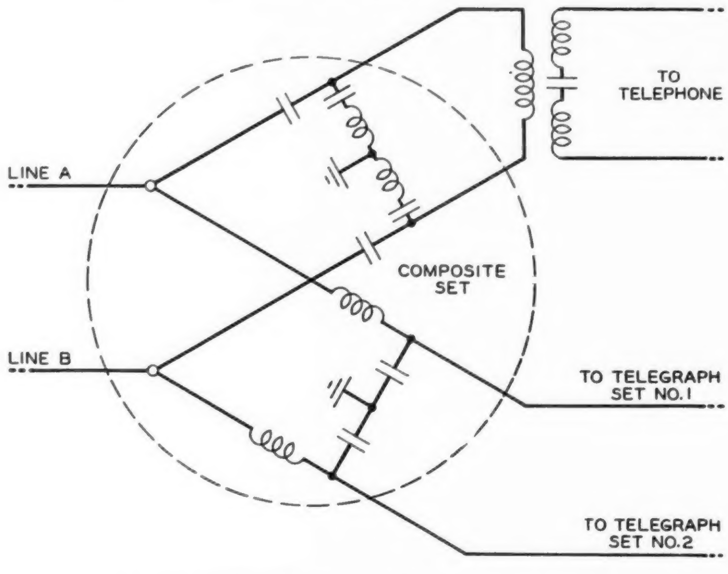


Fig. 5—A composite circuit separates telegraph and telephone signals by the insertion of filters, rather than by balance, as does the simplex circuit shown in Figure 3

The repeater consists of two relays: one for west-to-east and the other for east-to-west repeating. On each relay an auxiliary or "holding" circuit is required which will hold its own armature closed while the armature of the other relay is released to pass an open signal,

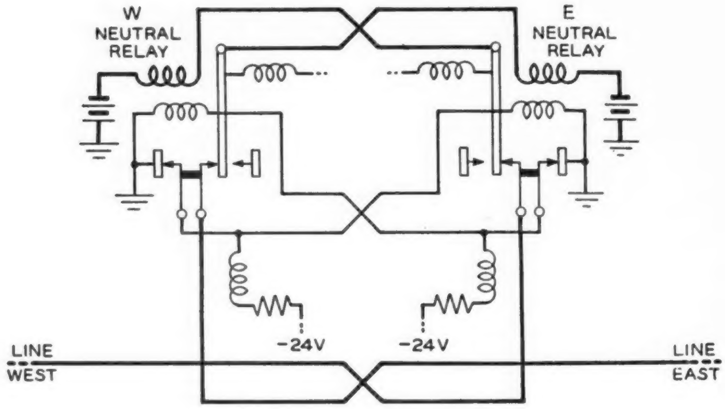


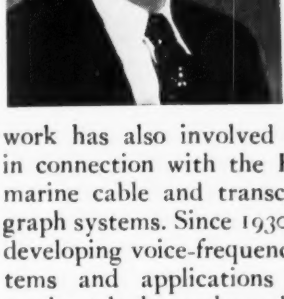
Fig. 6—Simplified schematic of a single-line repeater

regardless of whether or not the circuit through its own main winding is open. A closed signal traveling west to east passes through a contact on the relay designated E and closes the relay designated W—thus sending a new closed signal eastward from a local battery through the main winding of the relay E. A west-to-east open signal releases relay W over the same path, and thus sends an open signal eastward. If it were not for the holding winding on the relay E, however, this open signal would release relay E, and subsequent signals from the west would be blocked. Current for the holding winding comes from a local battery through a resistance and inductance. When relay W is operated, an auxiliary contact short circuits and therefore disables the holding winding on relay E. As relay W starts to release, this auxiliary contact opens before the main contact, and as soon as it opens, current flows through the holding winding of relay E to hold it operated all the time relay W is released. An identical circuit operates to hold relay W closed while an open signal is being transmitted from east to west.

Although such a repeater sends out a new signal at the full strength of the original, it does not correct for any errors in the timing of these signals. With the sounders and relays used with this system, the magnet operates the armature against the pull of a spring. There is some value of current at which the relay will operate and another and lower value at which it will release after having been operated. When the circuit is closed at the distant end, the current rapidly builds up, and as it reaches the "operate" value, the relay operates. When the circuit is opened at the distant end, the current starts to decay, and as the "release" value is reached the relay releases. The duration of the marking pulse as repeated by the relay is the period between these two instants.

The marking pulse as transmitted by the receiving relay starts later than the marking pulse as sent from the transmitting end by the time it takes the current to build up to the "operate" value, and it terminates later by the time it takes the current to decay to the "release" value. If the "operate" and "release" currents were identical, and if the shape of the building-up curve of current were the same as that of the decaying current, the duration of the marking pulse as repeated would be the same as that originated at the transmitting end. Neither of these conditions exists, however. The release current is less than the operate current, and the decaying curve differs from the build-up curve, due principally to a change in the circuit impedance. For the decaying curve the circuit is open at one end, and for the building-up curve it is closed. The parameters for the building-up and decay curves thus differ, and as a result the curves differ in shape. Any change in the line characteristics, moreover, may change the shape of the two curves differently, and produces a change in the duration of the marking pulse. This effect is exaggerated because the force on the relay armature is roughly proportional to the square of the current, and thus a small change in current produces a relatively larger effect on the behavior of the relay. The signals sent out by the single-line repeater, although they will have the full original strength of current, will not normally continue to keep the proper relation between the length of marking and spacing pulses. Because of this, neutral systems require very frequent adjustment of the tension of relay springs. This difficulty is overcome by polar transmission, which will be described in a forthcoming issue.

THE AUTHOR: B. P. HAMILTON was graduated by Columbia University in 1913 with the E.E. degree. He taught there for two years and then joined the Engineering Department of the American Telephone and Telegraph Company in 1915 to work on equipment design and later on field tests of high-frequency and voice-frequency carrier telegraph systems. Mr. Hamilton's work has also involved development problems in connection with the Key West-Havana submarine cable and transcontinental carrier telegraph systems. Since 1930 he has been engaged in developing voice-frequency carrier telegraph systems and applications of these systems to carrier telephone channels.



A Splice Detector for Army Field Wire

By F. S. HIRD
Transmission Engineering

ONE of the first difficulties encountered in attempting to lay telephone wire from an airplane was the breaking of factory splices. The field wire employed ordinarily comes in one-mile reels, and in preparing the wire for aero laying, the wire is recoiled with successive lengths spliced by tying square knots in the conductors. This is the standard method of splicing used by the Signal Corps in the field, and such splices are as strong as the unspliced wire. The reels as obtained from the manufacturer, however, often have splices made at the time the wire was insulated, either by butt-welding or by overlapping and soldering, and although these splices are satisfactory for ordinary uses, they generally will not withstand the forces involved in pulling the wire at high speeds from the coils in the planes. It was necessary, therefore, to locate all factory splices while the wire was being recoiled, and to resplice them by the square knot method.

Of the necessity for this procedure, there was no question, but as the old cook books state that to make a rabbit pie one must first catch the rabbit, so before remaking splices it is first necessary to find the original ones, and factory-made splices may be more elusive than rabbits. Since the insulation is continuous over them, they cannot be found by visual inspection. It would be possible to detect them by slowly passing the wire through the hands and feeling for stiff spots, but this is very slow and unsatisfactory. A much faster method of detecting splices was desired, and C. C. Lawson of the Outside Plant Department was asked to investigate the possibilities. Since the wire is of steel, it seemed that some magnetic method should be applicable and H. J. Williams of the magnetics research group was consulted. This group had recently encountered a very similar problem in connection with their studies of magnetic recording tape, and as a result they were able to set up apparatus in the laboratory to demonstrate the principles of a magnetic detector. Based on this method, L. Y. Lacy and the author were asked to develop a circuit and apparatus suitable for field use.

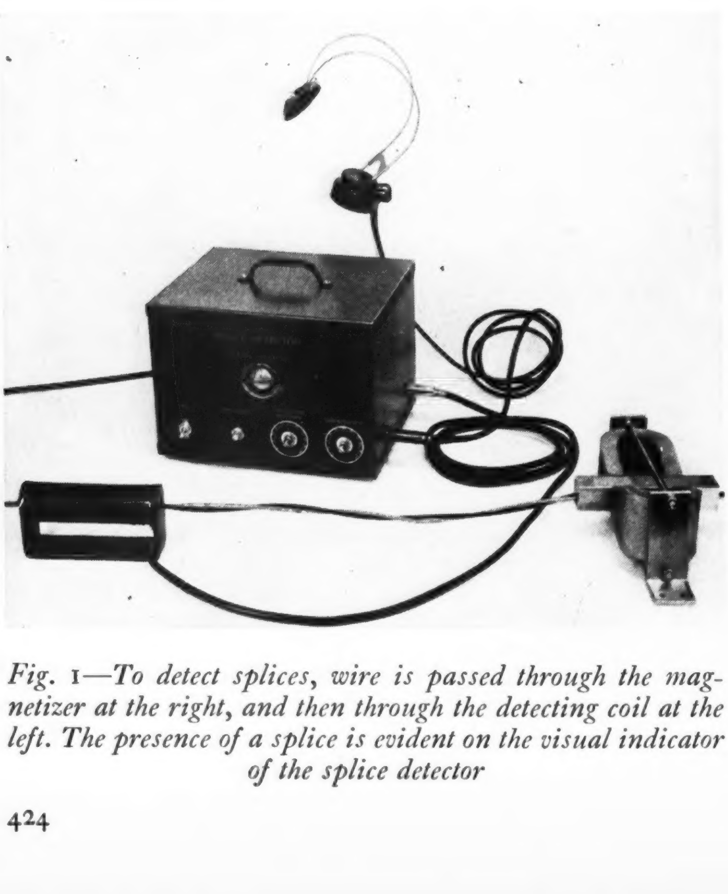


Fig. 1—To detect splices, wire is passed through the magnetizer at the right, and then through the detecting coil at the left. The presence of a splice is evident on the visual indicator of the splice detector

Regardless of the particular method of splicing, the iron circuit will be modified at the point of splice. Only in an ideal splice where neither the cross-section nor the characteristics of the wire were changed

would this not be true, and under these conditions there would be no change in the strength of the wire and thus no need to detect the splice. The detecting equipment developed takes advantage of this fact. The wire is first magnetized longitudinally by passing it through a strong magnetic field, and is then immediately passed through the center of the solenoid whose terminals are connected to an electronic detector. As long as the wire is uniformly magnetized, its passing through the coil will not affect the detector, but when a change in the magnetization of the wire occurs, a pulse will be generated that can be detected and used to signal the event. Since with this method the wire can be electronically inspected as fast as it can be drawn from the original reels, rapid and efficient detection of splices is possible.

The apparatus developed for this electronic splice detector is shown in Figure 1. At the right is the magnetizing unit, consisting of two powerful permanent magnets mounted with like poles facing each other against a rectangular brass bar drilled down the center with a hole slightly larger than the field wire. In unwinding the reels received from the manufacturer, the wire is first passed through this magnetizer, and then through the detecting coil, as shown. If the wire is of uniform cross-section and quality, the longitudinal magnetic flux produced by the magnetizer will also be uniform, as will be the magnetic field of force outside the wire. If there is any change in the wire, in either characteristics or cross-section, there will be a corresponding change in the magnetization and in the surrounding field. Under the former conditions, no voltage will be generated in the coil, but under the latter, a voltage will be generated that is proportional to the change in the field surrounding the wire and to the speed with which the wire is passing through the coil.

To detect such a generated voltage, the circuit shown in Figure 2 was designed. A two-stage amplifier increases any voltage generated in the coil and applies it to the grid of the gas-filled trigger tube V-3, which at once passes current and operates relay REL 1. This relay operates a buzzer to give an alarm; a telephone jack is shunted across the buzzer so that a headset can be used in

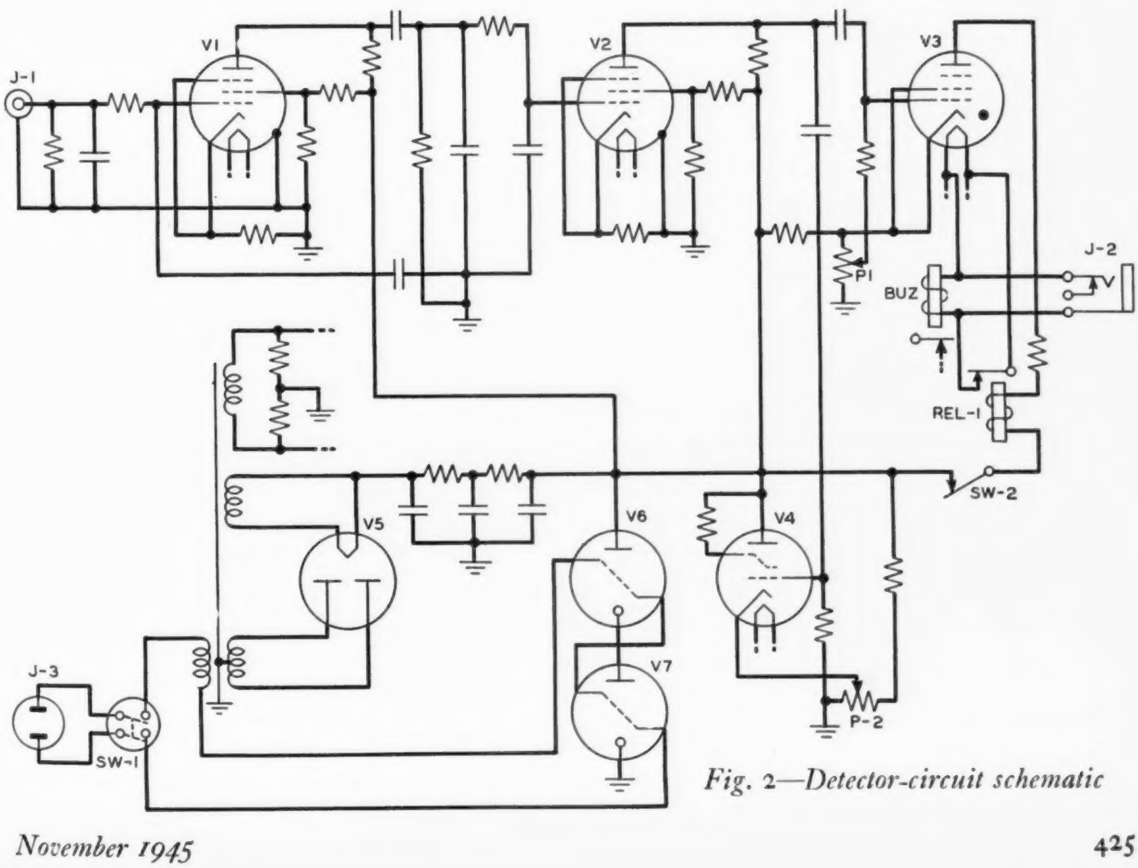


Fig. 2—Detector-circuit schematic

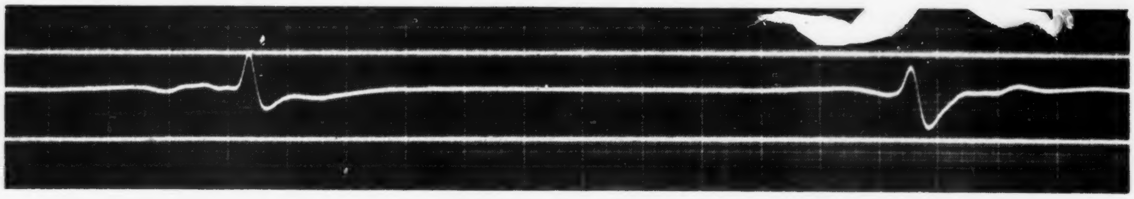


Fig. 3—Oscillogram showing at the right the pulse generated as a splice passes through the detecting coil, and at the left, the pulse formed as the splice is drawn back through the coil by hand

surroundings noisy enough to mask the sound of the buzzer. A visual signal is also given by an electron-ray tube, which is mounted near the middle of the splice detector as evident in Figure 1. The entire end of this tube glows except for a wedge-shaped shadow at the bottom, the width of which varies with the voltage applied to the trigger tube. Potentiometer P-2—controlled by the dial just to the right of the tube—permits the normal width of the shadow to be adjusted, and the potentiometer is set so that with unspliced wire running through the coil, the shadow is very narrow. When a splice passes through the coil the shadow widens—the width being proportional to the voltage generated.

Once the trigger tube has operated, it continues to pass current until its plate circuit is opened. To restore the circuit to normal after it has once operated, switch SW-2 is incorporated. The voltage at which the trigger tube operates is adjustable by potentiometer P-1.

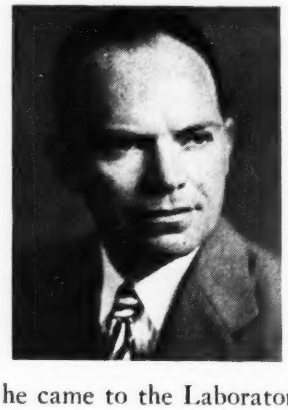
Besides these major operating elements, the detector circuit also includes its own power supply. This consists of a full wave rectifier tube, a filter, and two glow tubes in series to serve as a voltage regulator. The primary 115-volt power supply is carried in series through contacts in the base of both of these tubes so that if either is removed, power is disconnected.

Even unspliced wire may have minor irregularities that result in small variations in the field surrounding the wire after magnetization. These irregularities occur at high frequencies, however, and to prevent them from operating the trigger tube, filters are included in the input circuit of both amplifier tubes that attenuate the high frequencies sufficiently to avoid operation of the alarm.

Wire is run through the splice detector as fast as it can be unwound from the original reels, which is generally at a rate between 300 and 400 feet a minute. It is desirable to maintain as high a speed as practicable since the higher the speed the greater will be the voltage generated for any given irregularity. Speeds as low as 60 feet per minute are practicable, however. After an alarm has indicated the presence of a splice, the unwinding is stopped, the detector is reset by operating switch SW-2, and then the wire is drawn backward through the coil at a slow speed until an alarm again operates. This permits an accurate location of the splice, and resplicing can be promptly accomplished. The type of pulse generated by a splice as it is being drawn through the coil during the unwinding process and also as it is drawn backward by hand is shown in Figure 3.

This comparatively simple method has been found very satisfactory, and has greatly expedited the winding of the coils used for aero laying.

THE AUTHOR: F. S. HIRD received his B.S. degree from Iowa State College in 1929 and the E.E. degree in 1934. After a short period with the Radio Corporation of America he went to the Northwestern Bell Telephone Company where he was concerned with transmission and outside plant engineering problems in the Plant Engineering Department. Late in 1942



he came to the Laboratories for the duration of the war and since then has been engaged with development work on several war projects involving communication engineering.

D. B. Parkinson Visits Germany

WHEN D. B. Parkinson started for the European Theater of Operations last April as a Technical Observer, Germany was at the point of collapse. This occurred while he was there and gave him the unique opportunity of seeing at first hand the ending of the war in that country and the widespread destruction which it had caused. A few of his many vivid impressions follow:

"On Monday, April 16, I received a passport and orders to proceed by air to Paris, and to such other places in the theater of operations as might be necessary for the completion of my mission. From that point on things moved fast. Friday afternoon found me bewildered and practically out on my feet in Paris, after having had but four hours' sleep in the preceding seventy.

"Five days later our party left Paris on an observing mission to the various fronts, traveling in a jeep and accompanied by a truck carrying special equipment. Members of the party, besides myself, were Lt. Col. A. H. Warner, SHAEF, and Major R. A. Ransom, Office of the Chief of Ordnance.

"During the next three weeks we traveled over three thousand miles, principally through Germany. We got within sight of the Alps in the south, as far as Regensburg and Leipzig to the east, and north to Hanover and Brunswick. One section of the journey took us straight through the Ruhr region from Paderborn and across the Rhine at Dusseldorf; another through Aachen, Düren, Cologne and west on the remains of the road that had been the Germans' main supply route, toward the 'Bulge' and Bastogne. On V-E Day we were near Eisenach, a little town far enough east of the Ruhr to have escaped the worst of the destruction.

"Traveling through the German countryside at that time, when the whole organization of the Reich was crumbling, was a rather weird experience. Most of the cities were pictures of complete desolation, many such as Mainz, Ulm, Düren, Cologne, Aachen and Nuremberg had scarcely a single building

The photograph at the top of the page shows the Bavarian farmhouse where D. B. Parkinson (standing besides the jeep) and his party were quartered.

that retained a roof or even a second floor.

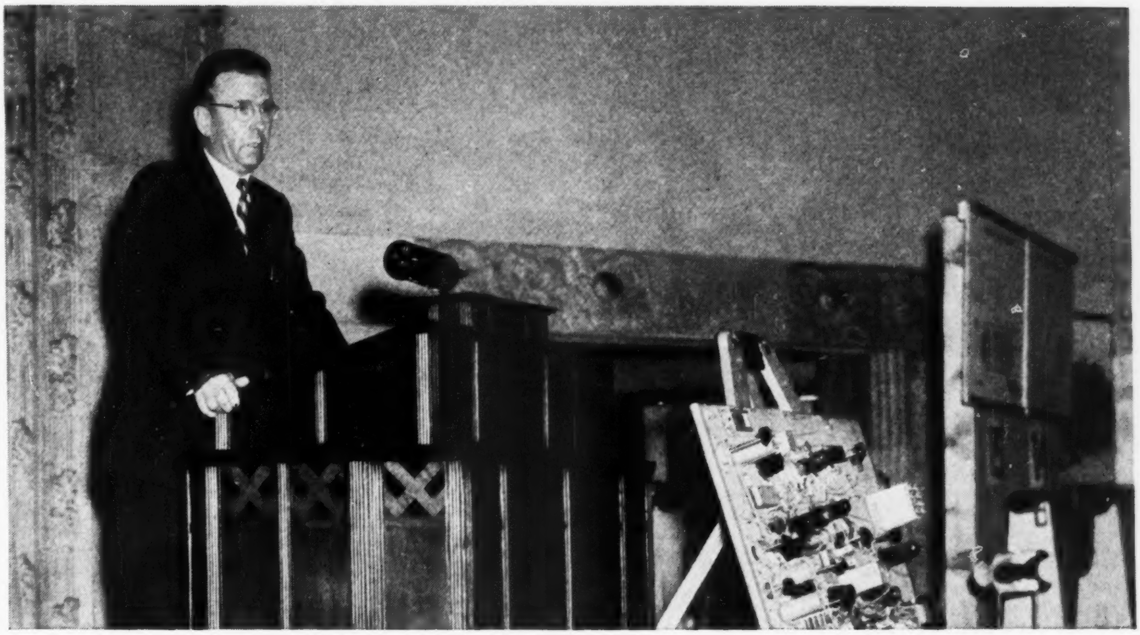
"French, Dutch, Belgian, Polish and Russian slave laborers, freed by the passage of the Allied Armies, and Germans who had been displaced by the war, were wandering by the hundreds along the highways in an effort to get home. They carried all they owned on their backs or in carts, baby buggies, or little wagons. Some had banded together and piled all their combined belongings into a farm wagon or buggy picked up along the road. They plodded along pushing at the cart or pulling at it with ropes. In Bavaria we got fairly close behind the spearheads, and there we encountered a great many German soldiers walking back along the highway, singly or in groups, hunting for a prisoner of war enclosure where they could give themselves up. The most notable spectacle of this kind was a German officer we met walking along holding up a small white flag on a stick. Lined up behind him, two abreast, were his men—maybe fifty or sixty in all—marching back in search of a prisoner of war compound. There was no Allied soldier, save our party, in sight.

"To a group traveling by auto, as we were, the remarkable performance of the engineers in repairing bridges was a constant source of comment. Nine out of ten of all bridge structures in Germany seemed to have been destroyed, bombed out by our air force or demolished by retreating Germans, yet repairs had been made so swiftly that we were able to roam practically at will across the countryside. In Southern Bavaria we came within a few hours of catching up with the spearheads, but the Baily bridges were already installed and the erecting crews were presumably on ahead of us somewhere.

"The gasoline and general supply situation also seemed to be completely in hand wherever we went. Gasoline was acquired simply by pulling in at the motor pool of any outfit encountered and pouring it in the tank. In the whole trip we never once encountered an outfit that hesitated in the slightest to 'gas us up' completely, including spare cans for a reserve supply.

"Much of the countryside seemed completely untouched by the war and except for the presence of the displaced persons wandering along the road, might pass for regions in this country. Wherever there had been serious fighting, though, the picture was entirely different—particularly in the section east of Bastogne where burned-out tanks, planes and trucks littered the whole area, in open country as well as near the roads. There the road was so cut up we drove miles at a stretch in second gear, with as many as fifteen burned-out and wrecked tanks in sight at one time—never less than three or four. The village of Bastogne itself seemed in relatively good shape, and from there west the road was excellent.

"After three weeks on the road, our party once more reached Paris, where I was given orders that took me to London for about one week. That ended my mission, and upon application to the Air Transport Command I was flown back to New York with a waiting time of less than twelve hours. Circumstances conspired against me again, however, and I arrived in New York, as I had in Paris, minus the two previous nights' sleep. The trip back was marvelously smooth, and accomplished entirely in daylight."



Laboratories Leaders Talk to Associated Company Men on Loan to the Laboratories

DURING the past four years the staff of the Laboratories has been augmented by the loan of approximately 450 engineers, draftsmen and others from the Associated Companies to aid in our war work. On September 19, a meeting of these men was held in the Auditorium to give them an overall picture of the work accomplished during these years and to give them an idea of communications developments planned for the post-war period.

G. B. Thomas was in charge of the program and introduced R. L. Jones, who described the various locations in New York and New Jersey where the Laboratories' work is carried on. He gave statistics of the number of people before and during the war; the number and cost of war development projects; the Laboratories' manufacture of preproduction models; and some aspects of Bell Laboratories' public relations.

D. A. Quarles then described the major developments of the war, including radar, sonar, rockets, computers and gun directors.

A. B. Clark reviewed the scope and effectiveness of the communications systems developed for war purposes and the performance of Laboratories' equipment in warfare.

M. J. Kelly expressed the appreciation of the Laboratories for the contributions made to its war effort by the men from the Associated Companies and discussed briefly some of the most urgent of the post-war telephone developments.

Wartime Policy of the Laboratories

In 1940, said Dr. Kelly, it was evident to the Bell System management that their Laboratories was an instrument of potentially great power in the expanding preparedness programs of our Government. The Laboratories were, therefore, made available through Western Electric Company contracts for such work as the Government agencies and the Laboratories should determine. From the beginning, the areas of work into which the Laboratories entered, and the volume of work performed in each area, have been guided by the fundamental policy that the best interests of our country's preparedness and, later, war effort be served. This policy has been interpreted by the Laboratories' technical management, in close coöperation with the different agencies of Government. The Bell System made its patents available without charge to the

Government for use wherever they could best serve in any facilities for the war effort.

Magnitude and Diversity of Effort

With the British and the N.D.R.C., our Laboratories have been at the forefront, bringing to the war effort the largest integrated organization in communications and electronics. Dr. Kelly said that it had been the experience of a lifetime to have taken part in this fine coöperative effort. The magnitude and diversity of the effort is reflected by the 20,000 visitors who streamed through the Laboratories in 1944. Of these, 515 came from abroad, 9,043 from industry, 9,000 from the Army and Navy, and 1,643 from N.D.R.C.

During the period from the beginning of 1940 up to July 1, 1945, the Laboratories, under contracts of the Western Electric Company with the Army and Navy, carried out research, development and design and advanced model production on communications equipments and electronic instruments of war to a dollar volume of approximately $140,000,000. The major portion of the work for the Services led to designs of equipment that were manufactured initially by the Western Electric Company. Its production for the Army and Navy during this time was in excess of $2,000,000,000. Almost all of this production was of designs completed at the Laboratories under the Army and Navy contracts.

Contribution of Men From Associated Companies

It has been a matter of great satisfaction that men from the Operating Companies could come here, fit in and help to do the war job. They totaled 456, of whom 366 were engineers, the remainder draftsmen and technicians. Nowhere else was such a pool of technical ability available; in fact, only a hundred carefully selected engineers were added from other sources. Thus the Laboratories did not dilute its professional staff, and was able to operate as an efficient, closely knit organization.

Considerable personal discomfort and in many cases separation from families and acute housing problems were accepted in good spirit by these Bell System men. In compensation, they knew that they were doing the type of technical job for the war that they could not have done back home. That experience should be useful in their future jobs, and it is bound to be good for the Bell System.

Radar

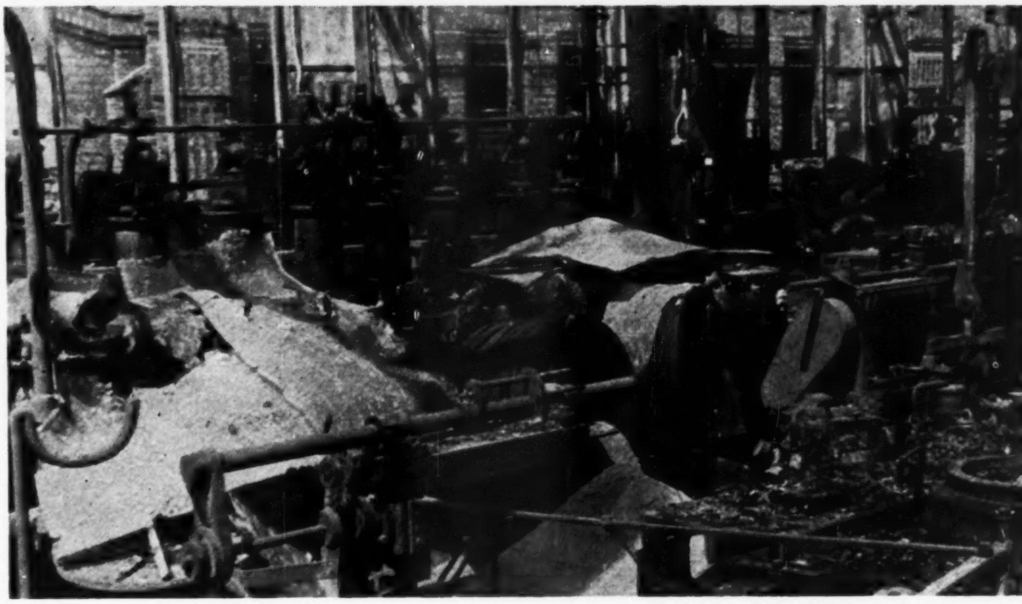
Radar is typical of our many areas of war activity. It was a new development of this war and required a rapidly moving research development and design effort all closely coördinated and interrelated. In the years immediately preceding, the Army and Navy laboratories, using available technology, developed relatively low frequency radars—up to 200 megacycles. In 1938 when the Service laboratories brought their radar developments to our attention, we saw that radar could be given broader applications by going to higher frequencies—to centimeter waves. We had the technology to do this. Working with the Radiation Laboratory, and the British, we carried the range from 200 to 10,000 mc and equipments operating in the higher frequency ranges became the predominant radars that were used by the Armed Forces.

Most of the research necessary to extend the frequency range some fifty fold was done by the British, the Radiation Laboratory and Bell Laboratories. It was coördinated and areas of work allotted in such a way as to avoid wasteful duplication. Our experience enabled us to jump in and contribute early in the game. We made the largest contribution to magnetron development, even though the original invention was made in England.

Post-War

During the war the Laboratories' research and development were diverted from long-range objectives to bear on the immediate problems. Even then, we turned up new ideas which will have peacetime application, and opened up new avenues of investigation which we could not explore. Now, with an organization stronger than ever, we return to our regular work—developing the systems and apparatus which will keep our country's telephone service the finest in the world.

Following Dr. Kelly's talk, J. J. Lukas showed the flight trainer movie and demonstrated the electronic engine noise circuit and H. O. Siegmund demonstrated rockets.



Survey of German Communications

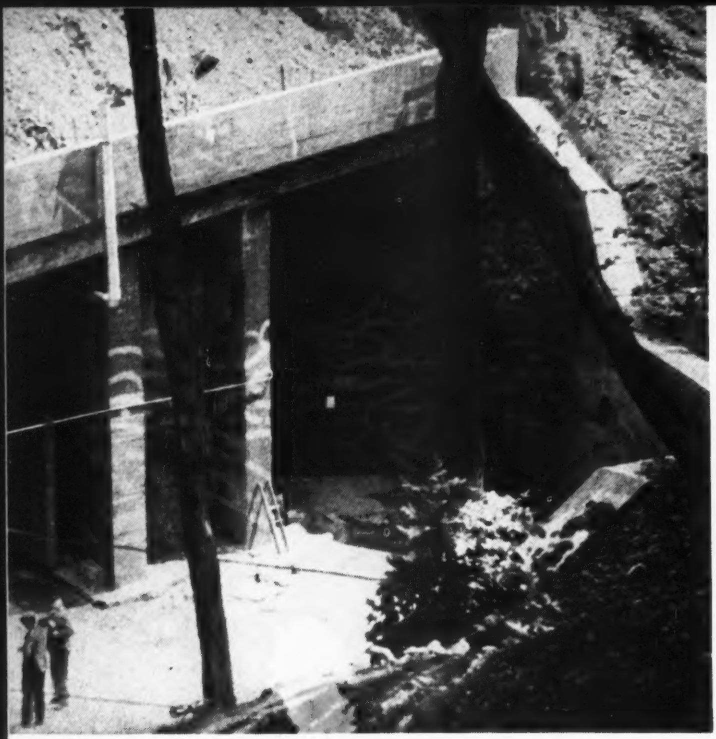
TRAVERSING Western Germany from the North Sea to Lake Constance a month after V-E Day, three Bell System men had an unusual close-up of German communications technique last summer. They were J. R. Townsend and Pierre Mertz of the Laboratories and R. H. McCarthy of Western Electric, and they were sent by the Technical Intelligence Committee of the U. S. Joint Chiefs of Staff to pick up all the latest ideas from our foes. In London, where they arrived by airplane about June 11, they saw a number of British communications centers, were taken in charge by the Combined Intelligence Objectives Subcommittee and allowed to interview several German technologists who had been brought over for questioning. In a few days they flew to Paris, where they were assigned a car, driver and interpreter. Part of their welcome in Paris was due to the courtesy of Lee Glezen of the Laboratories* who, just before he left, had set up some contacts which proved of value to the newcomers.

Field work really started when the Townsend-Mertz-McCarthy team arrived at headquarters of the British 21st Army at Bad Owenhausen. Among their early visits was a vacuum-tube plant, nine stories of it and all underground in a sandstone mine. In fact one of their outstanding impressions was the skill with which all sorts of critical installations had burrowed underground. Near Hamburg, through a tip from J. A. Parrott of A T & T, an earlier visitor on the same mission, they saw a telephone repeater station, built in 1937, entirely underground and camouflaged by a neat farmhouse. On their way into Essen they saw a heavy trunk cable projecting from a bomb crater. Nearby was a reel of similar cable and also a solidly concreted entrance down a flight of stairs. Inside was a well-equipped telephone-telegraph and broadcasting center of a railroad.

Procedure soon became more or less standardized. Arriving at an industrial town, the party called on the military government officer in charge, then on the Counter Intelligence people, from whom they learned who was who. In the plant they were to see they introduced themselves and began to ask questions. Since all were well grounded in the various arts of communications, they easily detected evasive or absurd answers and made it clear that there was to be no fooling. In factories, if any machine intrigued them, they ordered that it be put in

*RECORD, *July*, 1945, *page* 255.

When the roof fell on the wire-drawing plant shown, machinery was not badly damaged.



Entrance to an underground plant; the embankment that is shown in the foreground is to prevent skip-bombing

operation, and if its working was not evident, they directed that it be dismantled and fully explained. Often they called for plans and documents and photographed them on the spot. Any reluctance was disposed of by a firm manner, backed up by the Army uniform which all wore.

After two weeks the party returned to Paris for further briefing and then started off for southern Germany. They spent several days at Heidelberg where they interviewed a number of scientists, then, via Freiburg and Frankfurt, to Nuremberg. During several days at Munich, they visited a manufacturing plant at Dachau and took the opportunity to see the infamous concentration camp there. In the vicinity was a German signal battalion, who, under Signal Corps direction, demonstrated a broad-band carrier system for field use. In the cellar of an old castle they inspected a thoroughly modern plant for making vacuum tubes.

Returning to Paris on August 1, they spent a couple of days working on reports, then via London they came back to New York on August 7. They had motored 5,000 miles through France and Germany, slept in Army billets, eaten at Army messes when they could, otherwise subsisted on C and K rations. Fifty-nine technical reports have been filed in Washington, a number of pieces of apparatus have been brought over for study, and all in all the engineers secured a broad view of German thought on communications subjects.

Part of an exhaustive survey of German industry, this tour of Germany was only one of many made by American engineers and scientists. The broad study, in which the War Production Board and other civilian agencies of the Government have been cooperating with the Army and the Navy, has included not only developments and production methods in both consumer and durable goods industries of all kinds, but has covered the layout, construction, operation, and administration of electric, gas, communications, and transportation systems.

The experts who are making these investigations have been drawn largely from American industry, and nearly 250 of them have gone to Europe in connection with the work. Some have already returned, and others will go from time to time as specific needs for them develop during the next few months.

Conduct of the investigations in the various industrial fields has been under separate committees. L. H. Peebles, Director of WPB's Communications Division, has represented the War Production Board on the Communications Committee and has been its Chairman. As Executive Secretary for this Committee, G. D. Edwards of Bell Telephone Laboratories has been largely responsible for the planning of the work from the American end and for the selection of the

With a background of the Alps at Oberammergau, the Technical Observers paused for a portrait. Left to right, R. H. McCarthy, Pierre Mertz, J. R. Townsend and Cpl. Fred Fallard, their interpreter

investigators and other personnel. F. E. Henderson of Western Electric's Point Breeze Works and Mr. Parrott were among these investigators, in addition to Messrs. Townsend, McCarthy and Mertz.

Through national organizations as well as directly from individual companies and from Army and Navy laboratories, the Communications Committee has sought questions which would serve as leads in the selection of so-called "targets" for investigation in Germany. Valuable reports bearing on many of these have already been received from Communications Committee investigators, but they still have many such targets under study. Samples of German vacuum tubes and other communication apparatus evidencing improvements in design or manufacture, and even samples of manufacturing machinery, have also been shipped to this country for further investigation and study.

General Van Deusen of the Signal Corps presents Bronze Star Medal to E. L. Pedersen as General Bickelhaupt (left) and Dr. Buckley (right) watch

E. L. Pedersen Receives the Bronze Star Medal

Major General George L. Van Deusen of the Signal Corps, at an impressive ceremony in the twelfth floor conference room on September 28, presented the Bronze Star Medal to E. L. Pedersen for his contributions to the U. S. Army communications network in Europe. The citation, signed by President Truman, follows:

"E. L. Pedersen, Civilian Technical Observer with the United States Army from June, 1944, to March, 1945, performed outstanding service in connection with communications facilities in France. He organized, in collaboration with another technical observer, a school to train personnel in carrier and repeater work. In August, 1944, he supervised the installation of mobile telephonic equipment for use by the First Army in its swift advance across France. In Paris he assisted in establishing the military telephone exchange and directed the construction of toll circuits back to the Normandy area and forward to the battle lines. He labored long hours without rest to restore long distance telephone communications over a mixture of facilities including partially demolished French and German cables and hastily built American circuits. He continually helped increase the efficiency of Signal Corps units by instructing maintenance personnel and improvising methods for cable-crossing of rivers. By his high technical skill, resourcefulness, and extreme devotion to duty, Mr. Pedersen gave in-

Bronze Star Medal presented to E. L. Pedersen

valuable service during the campaign in Europe."

Following the presentation Brigadier General C. O. Bickelhaupt told in more detail about the technical observers' services in France, particularly their work on the rehabilitation of existing toll cables and on the installation and use of Spiral-4.*

Those attending the ceremony included members of the executive staff, department heads of System Development, representatives from Western Electric, and friends and associates of Mr. Pedersen.

**Traveling Telephone Consultant*, E. L. Pedersen, RECORD, *September*, 1945, *page* 337, and *Rehabilitating a Telephone System*, L. L. Glezen, *July*, 1945, *page* 255.

Servomechanisms Symposium

The Basic Science Group of the New York A.I.E.E. Section has scheduled a *Servomechanisms Symposium* consisting of six lectures. The Symposium will cover many of the interesting features of servomechanisms, both from the practical and theoretical viewpoints. The lectures follow:

Survey of the Field by Prof. Gordon S. Brown, M.I.T., November 14, 1945.

Mathematical Formulations for Linear Systems by Charles F. Rehberg, N.Y.U., December 12, 1945.

Transient Analysis of Linear Servomechanisms by Prof. John R. Ragazzini, Columbia, January 9, 1946.

Frequency Spectrum Theory Applied to Servomechanisms by E. B. Ferrell, Bell Telephone Laboratories, February 13, 1946.

Non-Linearity in Servomechanisms by L. A. MacColl, Bell Telephone Laboratories, March 13, 1946.

Applications of Servomechanisms by S. J. Mikina, Westinghouse Research Laboratories, April 10, 1946.

All lectures will be held at Columbia University, Room 301, Pupin Hall, at 7:00 p.m.

Radio-Telephone Service Resumed at Low Rates

The restoration of radio-telephone service between Australia and the United States to a peacetime basis and at a sizable rate reduction went into effect on September 15, for a three-minute telephone conversation from any point in this country to Australia the charge being $12.00 on week days and $9.00 on Sunday. Telephone service between the U. S. A. and Australia first opened in 1930 when all United States calls were routed through New York to England, and then to Australia over a radio-telephone link.

Through the ingenuity of Dutch engineers, radio-telephone service between the U. S. A. and the Netherlands was resumed on October 1, some weeks earlier than had been hoped for. By using salvaged radio equipment they had succeeded in putting their stations into workable condition and had put in a test call announcing that Amsterdam was ready for service while replacement parts from the United States were still on the high seas.

Paraguay and Uruguay calls also figured in a rate reduction effective October 1, when three-minute conversation between those countries and cities in the East, South and the Mid-West were reduced to $12.00 on week days and $9.00 on Sunday.

Rates for overseas radio-telephone service between the mainland of the United States and Hawaii, Puerto Rico, and Alaska were also reduced substantially as of November 1.

"The Telephone Hour"

NBC, Monday Nights, 9:00 p.m.

November 5	*James Melton*
November 12	*Nelson Eddy*
November 19	*Lily Pons*
November 26	*Jascha Heifetz*
December 3	*Ezio Pinza*

H. R. Jeffcoatt

H. M. Bascom

T. C. Fry

Organization Changes

T. C. Fry, Director of Switching Research, now reports to A. B. Clark, Vice-President and Director of Systems Development. Dr. Fry's present department has been combined with the Switching Engineering Department. The combined departments will hereafter be designated as the Switching Research and Engineering Department, with H. M. Bascom as Director of Switching Engineering and Dr. Fry as Director of Switching Research.

A. W. Horton, Jr., and C. A. Lovell have been transferred from the Physical Research Department to the Switching Research and Engineering Department and will report to Dr. Fry as Switching Research Engineers.

E. G. Hilyard, Switching Maintenance Engineer, and the group presently reporting to him have transferred from Switching Development to Switching Research and Engineering and will report to Mr. Bascom.

Mr. Bascom will continue to direct the work of the groups now reporting to him, together with that of the Switching Maintenance Engineer. Dr. Fry will direct the work of the Switching Research Engineers and will assist Mr. Bascom.

* * * * *

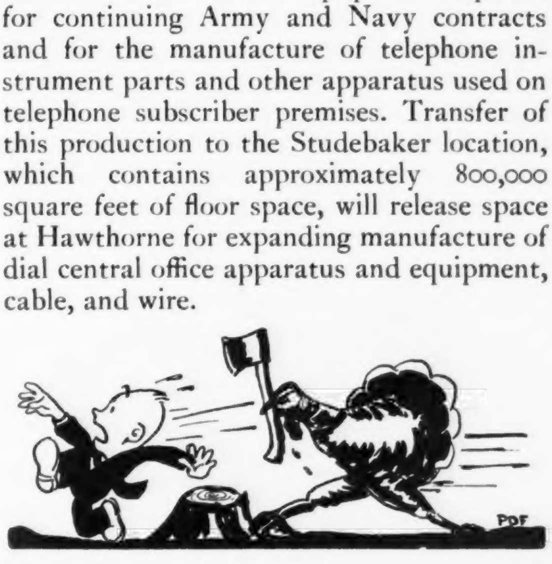
H. R. Jeffcoatt has been appointed Assistant to the Executive Vice-President to perform duties of a non-technical nature. C. W. Green continues as assistant to the Executive Vice-President on matters of a technical nature.

H. B. Ely, upon his return from military leave, was appointed Research Staff Engineer reporting to the Director of Research.

Additional Manufacturing Facilities for Western Electric

Western Electric Company is negotiating a lease for the Government-owned Studebaker plant in Chicago to augment the manufacturing facilities of the Company's Hawthorne Works. Acquisition of the new location, in which manufacturing operations are expected to start this year, will assist the Western Electric in speeding the production of telephone equipment.

The plant is located less than four miles from the Hawthorne Works and will be used for the manufacture of equipment required for continuing Army and Navy contracts and for the manufacture of telephone instrument parts and other apparatus used on telephone subscriber premises. Transfer of this production to the Studebaker location, which contains approximately 800,000 square feet of floor space, will release space at Hawthorne for expanding manufacture of dial central office apparatus and equipment, cable, and wire.



Colonel Hiram B. Ely

Colonel H. B. Ely, a West Point graduate, served with the Army from 1917 to 1929 before his affiliation with the Laboratories and was recalled to active duty during World War II on August 14, 1941. For the first year and a half he worked in the Office of the Chief of Ordnance in the Pentagon Building with the Assistant Chief of Ordnance in charge of procurement and production. Thereafter he was assigned to Frankford Arsenal, where he had previously been stationed seven years, as Chief of the Field Service Sub-Office. As such he was responsible for the maintenance and supply of all fire-control instruments and all anti-aircraft artillery. Establishing maintenance policies was his major job together with maintaining spare-parts lists, managing stock control in the ten basic warehouses throughout the country and securing technical manuals to accompany equipment. Among the 50,000 fire-control items supplied to the Army through his office there were binoculars, watches, 500 other optical instruments, M-9 directors and M-8 gun data computers. Twenty-five officers and fifty enlisted men attended the Laboratories School for War Training and were subsequently sent to theaters of operation to demonstrate equipment.

Shortly after V-E Day, Colonel Ely spent a month and a half surveying German industrial plants such as the well-known Zeiss and Leitz plants. He enjoyed the company of his son there for three weeks. Lt. Ely, Jr., was graduated from West Point in 1944 and served with the Ordnance Division of the First Army.

Colonel Ely returned to the Laboratories on October 1 and has been appointed Research Staff Engineer, succeeding H. R. Jeffcoatt, who has become Assistant to the Executive Vice-President on matters of a non-technical nature.

Lt. Col. Frank A. Parsons

Lieutenant Colonel Frank A. Parsons will return to work in his former department on November 18. Col. Parsons was a first lieutenant reserve officer when he began active duty. He reported to Aberdeen Proving Ground, Md., and was ordered to school for two months and thereafter assigned to a Replacement Training Center as an instructor for nine months. He was sent to the British Army Bomb Disposal School in England in January, 1942, and later as a Major became Director of the American Bomb Disposal School set up in April, 1942.

In January, 1944, Col. Parsons went overseas as Ammunition Officer assigned to the 1st U. S. Army Group which later became the 12th Army Group, having jurisdiction over the First, Third, Ninth, and Fifteenth Armies. While attached to General Bradley's headquarters he was in Luxembourg, Holland, France, Belgium and Germany and received the Bronze Star Medal for furnishing the General advance ammunition estimates.

William Dimella

Pvt. William Dimella returned to the Plant Department at Murray Hill after a year of military service. He spent fourteen weeks with the Engineers at Fort Belvoir, Va., and was then transferred to the Military Police at Camp Edwards, Mass. He was discharged in June and returned to work August 6, 1945, at the Murray Hill Laboratories.

Lieut. William C. Sylvernal

Lieut. William C. Sylvernal returned to work with the Laboratories after a distinguished AAF career. Enlisting in February, 1943, he trained at Atlantic City, Maxwell Field, Gunter Field in Alabama and Stewart Field at West Point from which he was graduated April 15, 1944.

He was sent again to Maxwell Field for B-24 training and trained at Casper, Wy., with a replacement training unit. In England, assigned to the 8th Air Force he piloted B-17's exclusively and completed nineteen missions. On his seventeenth mission he was shot down over Germany and was picked up by the Russians with whom he lived four weeks before the ATC flew the crew back to their base in Lavenham, England. He has been awarded the Air Medal with two clusters, the Silver Star Medal and may receive the Distinguished Flying Cross. He arrived home in July, took a thirty-day furlough and reported to Drew Field, Fla., for separation from military service.

Capt. George M. Richards

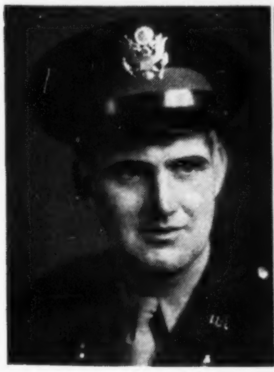
George M. Richards enlisted as an aviation cadet in December, 1941, and went to Maxwell Field, Ala., and Turner Field, Ga., graduating as a navigator with the commission of second lieutenant on July 4, 1942. He went overseas with the 90th Bomb Group, the "Jolly Rogers," and operated around New Guinea, Northern Australia, the Bismarck Archipelago and Dutch East Indies for a year, during which time he completed twenty-nine missions and 277 combat hours. His crew sank a tanker, badly damaged a cruiser and shot down five enemy planes. He also participated in anti-submarine patrol duty at Hawaii, the Papuan campaign, Bismarck action and the Solomon Islands. Capt. Richards was awarded the Distinguished Flying Cross, Air Medal with two oak-leaf clusters and the Distinguished Unit Citation. After his return to the States in September, 1943, he was assigned to Tonopah, Nev., as a B-24 navigation instructor. Capt. Richards has returned to work at Murray Hill Laboratories.

Capt. Einar Reinberg

Einar Reinberg has returned to the Equipment Development Department after almost five years of military service. Called with the National Guard as a second lieutenant, he was successively stationed at Fort Dix; Fort Benning; Claiborne, La.; Fort Lewis, Wash.;

Col. H. B. Ely

Capt. Reinberg



Lt. Col. Parsons

Capt. Richards

Lt. Sylvernal

Lt. Comdr. Hart

Joseph Ontka was responsible for carrying wounded Marines from Iwo Jima to hospital ships. His head shows at left of the photograph

Fort McClellan, Ala.; Camp Campbell, Ky.; and Fort Jackson, S. C. Shipped overseas in August, 1944, he participated in the Battle of the Bulge, Ardennes, Rhineland and Central European campaigns. Captain Reinberg was awarded the Bronze Star Medal for exceptional success as a battlefield commander and, in addition, has the Combat Infantryman Badge and Purple Heart.

Grace M. Goodall

Grace M. Goodall enlisted in the Women's Army Corps on March 20, 1943, and was with the first company ever assigned to Camp Ruston, Louisiana. Following six weeks' basic training, she transferred to the 1st Wac Detachment at the Army air base in Baton Rouge, Louisiana. As pioneers, this group of Wacs faced initial male resistance and opposition to their work. Miss Goodall, as a classification specialist, worked with personnel records in the classification office. Although based there for the remainder of her military service, she was at one time sent for four months to Denver and Pueblo, Colorado, by the Regional Office, where she aided with recruitment, and was later stationed for five months at a B-29 air base in Pratt, Kansas, checking classification records.

Grace Goodall

William Dimella

Miss Goodall has returned to her former position with the Patent Department.

Lt. Comdr. Harry C. Hart

Lt. Comdr. Harry C. Hart was commissioned in April, 1942, and ordered to Long Island City as Technical Assistant to the Naval Inspector of Ordnance at the Ford Instrument Company. Promoted to his present rank in April, 1944, he was also made Officer in Charge of Inspection at the Ford Instrument Company. He worked at fever pitch until this spring, collaborating with engineers of seven companies doing fire-control work and with the Bureau of Ordnance in Washington from planning stages and models to production, with emphasis on production. During this time he also spent two weeks on a destroyer shakedown cruise to observe fire-control equipment in operation. After V-J Day, with the termination of war contracts, Commander Hart was permitted to leave to resume work with the Laboratories in the Patent Department.

Capt. Anderson

Arthur Wright

Capt. Nils H. Anderson

Capt. Nils H. Anderson has returned to work with the Equipment Development Department after five years with the Army. He spent ten months in actual combat as Communications Officer with the infantry in the Tunisian and Italian campaigns, was hospitalized at Walter Reed Hospital in Washington as the result of wounds received

from a mortar shell and had been in charge of combat firing problems at Camp Croft, S. C., for a year.

Capt. Anderson has been awarded the Bronze Star Medal, Purple Heart, Combat Infantryman Badge and two battle stars on his European theater ribbon for major engagements at Fondouk Gap and on Hill 609, during which Capt. Anderson's outfit kept open communications lines which contributed to the breakthrough and final victory.

Joseph F. Daly

Joseph F. Daly, Chief Warrant Officer, has been returned to civilian life and to the Army inactive status list. A draftsman of the Systems Development Department, he entered service in February, 1941, and, after being trained in early warning radar, was sent overseas that same year. He spent a great deal of time among the Fiji Islanders and worked for one nine-month period in their jungle land operating and maintaining radar; he also participated in the Battle of the Solomons. Mr. Daly returned to the States in 1944 and served as radar instructor and supervisor at Florida and California bases until October 1.

Joseph T. Murphy Killed in Action

The War Department has officially listed Joseph T. Murphy, missing in action in France since December 9, 1944, as having been killed in action.

Mr. Murphy was with the Laboratories since July 29, 1940, and successively held the positions of night cleaner, cleaner, night watchman and metal and wood finisher prior to entering military service on December 3, 1943. His first assignment was to Camp Wolters, Texas, and then to Fort Meade, Md., before going overseas with the 560th Replacement Company of the 181st Infantry in the fall of 1944. Pvt. Murphy was in an attack and when his platoon later reassembled he was missing.

Joseph T. Murphy, 1910-1944

Charles A. Kossmann

Charles A. Kossmann entered military service October 5, 1943, and after being trained at Fort Benning, Ga., and Camp Livingston, La., he was sent overseas September 24, 1944, as a replacement with the 28th Infantry Division. He saw action with the First Army in France, Belgium and Germany in the Hurtgen Forest. Hospitalized on Thanksgiving Day with trench feet, he returned to the States in February and was in the U. S. General Hospital, Camp Butner, N. C., until his discharge on June 28, 1945. Mr. Kossmann will study mechanical engineering at the Polytechnic Institute of Brooklyn under the GI Bill of Rights.

Arthur Wright

Corporal Arthur Wright is glad to be back with the General Accounting Department rather than in the Pacific for which he was destined after serving in the European theater. The news of the reduction in age requirements for discharge came while he was aboard boat after V-J Day. Mr. Wright entered military service in September, 1943, and was stationed at Aberdeen Proving Ground, Md., with the Ordnance Branch. He did clerical work for the battalion headquarters for sixteen months while in the

Joseph Daly shown with W. L. Heard to whose drafting department he has returned

United States and spent six months in Antwerp, Belgium, with a finance unit.

William R. O'Neill

William R. O'Neill was discharged October 1 and returned to work after three weeks' vacation and over two years of military service. Mr. O'Neill took basic training at Keesler Field, Miss., was later assigned to Greenville Army Air Base, S. C., and sent overseas on October 20, 1943. He worked with the 9th Army Air Force in squadron and quartermaster supply for the 302nd Transport Wing and has been to Normandy, Northern France, Ardennes, Central Europe and the Rhineland.

E. L. Chinnock

W. R. O'Neill

Edwin L. Chinnock

Edwin L. Chinnock has returned to work at Holmdel following discharge from the Navy. He was the first man to be discharged through the Bainbridge, Maryland, Naval Separation Center.

Mr. Chinnock has a total of eleven years' service with the Naval Reserve and was called to active duty on December 27, 1940. After a thirty-day refresher course at the Radio Procedure School in Norfolk, Virginia, he was assigned to the Tenth Naval District in San Juan, Puerto Rico. There he was engaged with the Communications Intelligence Unit in checking German naval activity in the Atlantic which took him to Antigua in the British West Indies, Trinidad, and Curacao in the Dutch West Indies. At the end of two years, he was assigned two years more with the First Naval District at Chatham, Cape Cod. His orders for duty in the Far East were canceled one day before his planned departure.

Capt. Charles J. McDonald

Capt. Charles J. McDonald was awarded the Bronze Star Medal for meritorious achievement in connection with military operations against the enemy in the Philippine Islands from November 19, 1944, to June 25, 1945. He maintained a continuous system of motor transportation and supervised maintenance shops, often in areas subjected to hostile artillery and mortar fire.

John J. Lordan

John J. Lordan received the Bronze Star Medal for meritorious service in action from December 25, 1943, to March 19, 1945, in North Africa, Italy and France. His citation reads: "As Truck Driver and Assistant Lineman for his Battery, Technician Fifth Grade Lordan displayed a high degree of courage and attention to duty while installing and maintaining vitally important lines of communication. At all hours he was called upon to lay or repair lines, often working through areas under enemy artillery fire."

* * * * *

E. Dietze, F. H. Graham, E. Hartmann, R. J. Tillman and Genevieve Weldon have been reinstated in the Laboratories from personal leaves of absence which were granted in May, 1942, in order that they might do war work for the N.D.R.C.

Louis A. Bergdahl, RT 2/c, took his preradio at Wright Junior College, Chicago, primary radio at Texas A. & M., and secondary radio at the Naval Research Laboratory. He has been a member of a special group making the initial installation of anti-aircraft fire-control systems aboard ships and is now assigned to an anti-aircraft training and test unit at Damneck, Va.

Robert F. Graham has been studying B.T.L. made equipment—"one of the best and most used pieces of airborne radar. It is interesting," he writes, "to understand the workings of a large schematic such as I used to draw at the Laboratories."

A Seabee of the 91st Construction Battalion, Chief Electrician's Mate James M. Cullen visited friends in the Plant Department while on a rehabilitation leave. Chief Cullen has been in service since 1942 and returned by airplane carrier and plane from the Philippines where he had been responsible for communications on Monicani Island.




L. A. BERGDAHL R. F. GRAHAM J. M. CULLEN CAPT. HINSHAW

ANOTHER VISITOR to West Street recently was CAPT. FOSTER A. HINSHAW of the Coast Artillery Board, Fort Monroe, Va. A member of the Systems Development Department Special Problems Group, all of Capt. Hinshaw's military service has been with the Coast Artillery Board, which is responsible for testing all of the equipment, radar guns and ammunition used by the Coast Artillery.

ENSIGN FRANK E. WOLLENSACK has been transferred back to The Southern New England Bell Telephone Company, effective October 15, 1945. He was previously studying radar at M. I. T. while on military leave of absence from the Laboratories.

ROBERT H. MEUSER, who formerly worked in the library, says he has been put in charge of the Special Service Library — "must be due to my previous experience in BTL's library, sure would like to go back there when I get out."

CHARLES S. GRAHAM recently arrived home after being attached to Headquarters, Anti-Aircraft Section, of the Ninth Army, during which he was in the cleaning up of the Brest Peninsula in Northern France, Belgium, Holland, Aachen, the Rhineland Battle, and halted at the Elbe River. After the end of the war, he was able to do some sightseeing in the Harz Mountains and Southern Germany.


Recent Bronze Star Medal winners, Capt. C. J. McDonald and J. J. Lordan

The following members of the Laboratories on military leaves of absence have received promotions:

Eugene J. Breiding, ART 3/c(T); Clayton B. Brown, RT 2/c; Harry B. Compton, RT 2/c; Charles H. Dalm, ACRT; Pfc. Robert F. Flinn; Cpl. Bernard C. Guinter; Cpl. William P. Harnack; Lt. Comdr. Charles A. Hebert; T/4 Henry G. Hohner; Pfc. David W. Jones; Margaret S. MacIlvaine, PhM 2/c; Sgt. Ira S. Markowitz; Sgt. Joseph R. May; T/5 Hans W. Menzel; Sgt. Robert H. Meuser; T/5 Herbert K. Meyer; Lt. (jg) George E. Oram; T/Sgt. Harold Phares, Jr.; Seferin E. Pulis, RT 2/c; T/5 George H. Reinhardt; Comdr. John R. Sackman; T/3 Henry H. Sharpe; 1st Lieut. William C. Sylvernal; 2nd Lieut. Albert B. Watrous; Pfc. Philip E. Watts; Pfc. Wayne F. Wilson; Ens. John M. Woitovich; Capt. C. J. McDonald.

CHARLES T. BOLGER spent twenty-one months on Potts Island near New

The "High-tailed Lady," B-17 bomber which Lt. William C. Sylvernal crash-landed in Germany after three engines had been shot out, the bomb bay damaged and controls injured

Caledonia where he worked with the Navy and 13th AAF on radar and radio operation protecting the air-sea route from Hawaii to Australia. He returned to the States to study new combat radar and radio and stopped to visit his friends in the Laboratories before reporting to Alexandria Air Base, La.

LIEUT. RALPH D. HORNE, former prisoner of war, has reported to Lockburn Army Air Base, Columbus, Ohio, for a six- to ten-week refresher course on B-17's.

HENRY ALGARIN is permanently stationed in his birthplace, Puerto Rico, until he is discharged. His wife is with him and they have been touring the island, noting the improvements which have occurred since he left Puerto Rico several years ago. In the Navy he is learning a new field—refrigeration and air conditioning.

WORLD WAR II has advanced the science of map making to its most accurate stage in history. MAJOR IRVING C. OSTEN-SACKEN, with the 311th Photo Reconnaissance Wing and the Geodetic Control, headquartered at Buckley Field, has, as operations officer in charge of geodetic control in the Middle East, charted wild and unknown African country by air. Flying C-47's, or helicopters where rough terrain and impassable jungle make C-47's or amphibians impractical, Major Osten-Sacken and crew daily risked their lives that the Government might have an accurate map of the world and its individual countries.

CPL. ROBERT LOGAN, USMCR, looked fine after his return from twenty months of Pacific duty when he visited his Laboratories friends while on rehabilitation leave. Cpl. Logan participated in the Guam campaign and was also at New Caledonia, Guadalcanal, the Johnson Islands and Honolulu working on maintenance of land-based radar. He will report for further radar training to New River, N. C.

LT. COMDR. EDMUND G. SHOWER's work with the Bureau of Ships took him to Building T on business. He has been responsible for the coördination of vacuum-tube development for the Navy which has taken him to many plants throughout the United States and in addition he spent one month in the Pacific aboard the U.S.S. *St. Paul*, a heavy cruiser, observing vacuum-tube operations under combat conditions. This ship fired the last salvo at the Japanese by obtaining special permission after the "cease firing" order, since their guns were already loaded.

SGT. H. H. GEORGENS, Technical Assistant in the Research Department at Murray Hill, now on military leave, called there recently while on furlough after returning from Europe. He is an electrical apparatus repairman in the Air Corps and expects to be sent to the West Coast.

LT. PETER L. HOLLOD, of the 8th Air Force, visited the Laboratories at Murray Hill and his friends in his former department after returning from overseas duty.

Leaves of Absence

As of September 30, there had been 1,009 leaves of absence granted to members of the Laboratories. Of these, 88 have been completed. The 921 active leaves were divided as follows:

Army 511 Navy 308 Marines 28

Women's Services 74

There were also 19 members on merchant marine leaves and 13 members on personal leaves for war work.

Recent Leaves

United States Army

Stanley F. Swiadek William O. Zvonik

United States Navy

Charles Shea James Louis West

313 veterans of World War II have been employed by the Laboratories

James J. Madden and Henry Petzinger were recent visitors to Murray Hill.

Lieut. Albert B. Watrous returned to the States and visited the Labs on a thirty-day furlough after serving one year with the Infantry, Signal Corps and Ordnance branches of the 5th Army in Italy where he was stationed at Naples and Lake Garda.

Lt. Col. Andrew W. Clement, who has been with the Coast Artillery Guard, Fort Monroe, Va., since February, 1941, recently took a four-month "jaunt" to combat areas in the Pacific, acting as observer for Headquarters, Army Ground Forces. Taking new radar equipment to Hawaii, he spent time there, and also inspected the seacoast batteries and battalions on Angaur Island, Peleliu, Guam, and Saipan during a six-day, 8,000-mile air journey. As a member of the Coast Artillery Board, he assists in the study, testing and analysis of matériel and matériel problems. It was there that the M-9 gun director was first tested.

Martin J. Corley arranges recreational activities and athletic programs for the troops coming home from the European theater aboard the S.S. *Lincoln Steffens.*

Comdr. J. R. Sackman reports he is shaking down vessels that will be assigned to the fleets at Norfolk, Va.

Merle I. Hampton was last reported just outside Manila in the Philippines.

Hans W. Menzel, also in the Philippines, hopes to be home for Christmas.

Frederick W. Hold has been transferred to Manila, Philippines Base Section Headquarters. Ordnance technical reports and maintenance activities take up most of his time and are a welcome change from supervising field maintenance.

John J. Barrett sent greetings from Shoemaker, Cal., while waiting for a ship.

Ensign Harold C. Bell says he's looking forward to being in those "wonderful States" as soon as possible now that the war is over.

Lawson F. Cooper, stationed in Saipan, "this sun-burned piece of coral," has been busy in their radio repair shop checking and repairing radio equipment, but has seen much of the island and many traveling stage shows.

Robert F. Flinn has returned to the Philippines for a rest after the Okinawan campaign.

Lt. Watrous

Lt. Col. Clement

J. J. Madden

H. H. Georgens

Lt. P. L. Hollod

H. G. Petzinger

G. A. Kelsall L. D. Plotner

Retirements

Among recent retirements from the Laboratories were three at their own request—E. S. Wilcox with forty-two years of service; L. D. Plotner, twenty-nine years; and Joseph Jakubiak, twenty-eight years. Retiring under the Retirement Age Rule were G. A. Kelsall with thirty-three years of service; Max Nowak, thirty-one years; and James Cusack, twenty-nine years.

Loyd D. Plotner

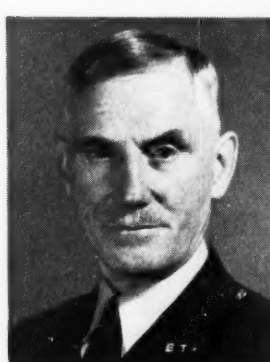
Mr. Plotner, "Pop" as he is known to his many friends, began his Bell System service in 1916 although he was in the telephone business ten years earlier, installing telephones, shooting trouble and collecting bills for his father who owned several small independent exchanges. Radio was just being heard of at that time and in order to get experience, Mr. Plotner joined the Navy, where he took part in experimental tests of the earlier radio transmitters. Then, after three years in railroad communications, Mr. Plotner entered the maintenance organization of The Bell Telephone Company of Pennsylvania and transferred to the Laboratories during 1919, where he was assigned to the testing of step-by-step and PBX circuits. In 1922 he took charge of that group which set up and, by test and analysis, approved the design of the circuits and apparatus and was co-responsible with the design group for the operation of the step-by-step system.

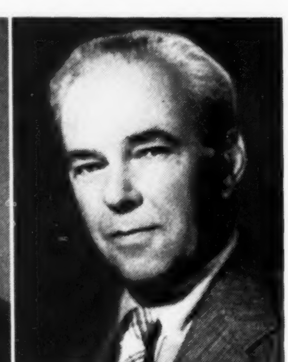
Two experiences in his career Mr. Plotner recalls with particular pleasure. One was his assignment to the airplane carriers *Saratoga* and *Lexington* to observe the operation of the step-by-step PBX's during battle practice; his Navy training made the experience like a homecoming and enabled him to recommend maintenance procedures which fitted well into Navy traditions. The other experience was during the Williamsport flood of 1936 when he assisted in restoring that office to service after the switch room had been flooded with four feet of water.

George A. Kelsall

When G. A. Kelsall joined the Western Electric Company in 1912, he little thought that he would take an important part in developing the remarkable new magnetic materials which have since become known as the permalloys, perminvars and permendurs. After graduating from Rose Polytechnic Institute in 1906 with the degree of B.S. in Electrical Engineering, he spent three years with the General Electric Company at Schenectady and with the Indiana Steel Company at Gary. In 1909 he went to Michigan State College for three years as instructor in Electrical Engineering.

Mr. Kelsall came to West Street and since then his work has been closely associated with magnetic materials, for the first five years on loading coils in the Physical Laboratory. During this period, taking part in the development of powdered-iron core material, he developed an a-c permeameter for measuring permeability of toroidal cores. These permeameters have been used continuously in the Laboratories in the development of new magnetic alloys and at Hawthorne in the inspection of magnetic cores. He also developed the permeameter furnace for measuring a-c permeability at elevated temperatures. Patents have been issued to him relating to loading coils, magnetic test-





James Cusack E. S. Wilcox

ing apparatus and magnetic materials; and he has written several technical papers. Since 1917 his efforts have been directed to fundamental studies of magnetic materials and during this time he has investigated over twenty-five hundred alloys.

James Cusack

Before joining the Bell System as a watchman in 1916, Mr. Cusack had spent seven years with the firm of E. C. Rich in New York City. At the time of World War I he was a watchman on the outside of the 463 West Street building during the period that twenty-four-hour guard service was maintained. In recent years, as an Usher and Guard, he has been a familiar figure at the West Street building entrances and as an escort to the Paymasters.

Edgar S. Wilcox

Mr. Wilcox joined the American Telephone and Telegraph Company as a night telephone operator at Maumee, Ohio. Two years later he took an electrical course at the New York Trade School and then went to work in the Equipment Construction Department of the Long Lines Department in New York. Late in 1906 he transferred to an Equipment Maintenance group at Chicago.

Since 1911, when Mr. Wilcox transferred to the Long Lines District Office in Chicago, he has been largely engaged with investigations to reduce noise and crosstalk in telephone circuits. In 1921 he came back to the Long Lines Engineering Department in New York and then, in 1924, transferred to the Toll Transmission group of the D. and R. His first work there was to make a crosstalk survey between New York and San Francisco on the central transcontinental line in order to determine the maximum transmission level permissible from the crosstalk standpoint.

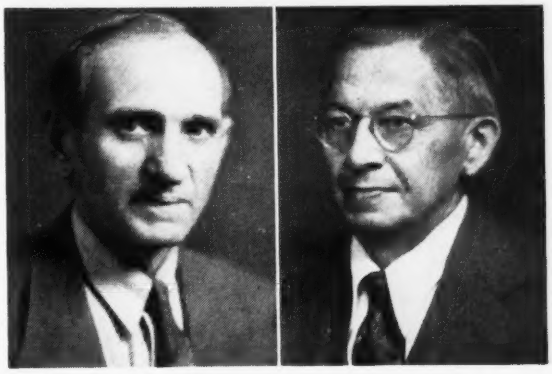
Mr. Wilcox spent several years in the Middle West making crosstalk measurements. Returning to New York, he made crosstalk tests and attenuation tests on experimental types of cables for studies of their carrier possibilities. Since transfer to the Laboratories, Mr. Wilcox was usually in the field, first in Colorado and then in Texas, making crosstalk performance measurements of new transposition designs for open-wire lines intended for type-J carrier operation. Similar measurements on old and new cables, especially those balanced for type-K carrier operation, took him to the East, South and West. During the war years his field testing, particularly in Florida, was chiefly necessitated by requests by Government agencies for information regarding various confidential and secret projects.

Joseph Jakubiak

Mr. Jakubiak was employed by the Western Electric Company at West Street in 1917. During his service with the Western Electric Company and later with the Laboratories, he was a member of the Building Service group, working as a Cleaner and Freight Elevator Operator. For the past year he had been absent due to sickness.

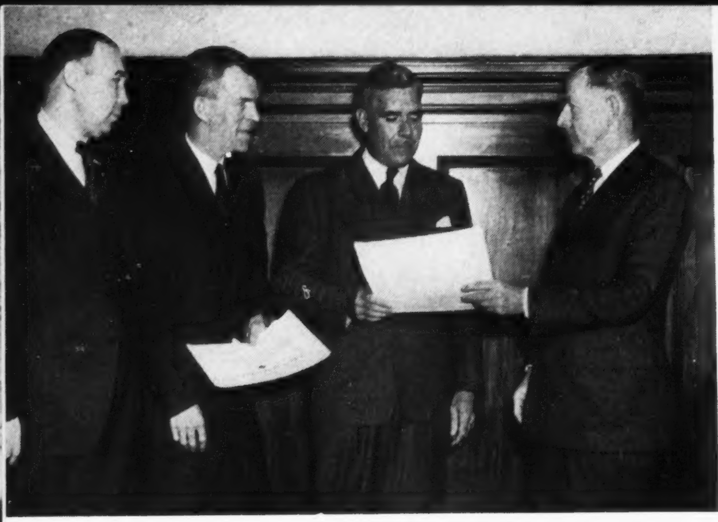
Max Nowak

Mr. Nowak was born in Austria and before coming to this country in 1912 spent fourteen years with one of the largest rifle manufacturers in Austria as a precision instrument maker of tools and gauges.



Joseph Jakubiak — Max Nowak

In 1914 Mr. Nowak joined the Western Electric Model Shop as an instrument maker. Since then most of his time had been spent on the making of accurate dies and tools—he was in the Precision Room since its formation nearly twenty years ago. Some of the special work that he has done includes the making of a high-precision dividing head used primarily for laying out disks for television systems, a rolling mill and slitting machine for the tapes or ribbons used in light valves, and many complicated and intricate molding dies for plastic materials.



E. A. Jones and R. L. Shepherd Honored for Life Saving

On August 5, 1944, an elderly man who was swimming in the Manasquan River was suddenly overcome. Edgar A. Jones, a New York Telephone man on loan to the Laboratories, swam to his rescue, brought him ashore and began resuscitation. In a few minutes Mr. Jones was relieved by R. L. Shepherd of the Bureau of Publication, who carried on until an ambulance arrived.

Recommendations were forwarded to the American National Red Cross and to the National Safety Council, and at a luncheon on October 4, Vice-President R. L. Jones presented to both men the Red Cross Certificate of Merit. The National Safety Council's President's Medal was presented to Mr. Jones, and its certificate for meritorious service to Mr. Shepherd.

Guests at the presentation were H. F. Deininger, Division Installation Superintendent, South Manhattan, New York Telephone; W. Fondiller, Assistant Vice-President of the Laboratories; B. B. Webb and H. A. Blake of Staff; R. K. Honaman and P. B. Findley of Publication; and G. B. Thomas and J. S. Edwards of Personnel.

Requirements for the Red Cross award are that the recipient must hold a Red Cross First Aid or Life Saving Certificate, that proper technique was used and that the victim would have perished otherwise. A requirement for the National Safety Council's Award was that a life was saved by the prone-pressure method of resuscitation.

In the photograph above R. L. Jones presents life-saving awards of American Red Cross and National Safety Council to R. L. Shepherd and Edgar A. Jones, second and third from left, respectively, as H. F. Deininger of New York Telephone looks on.

Meritorious Civilian Award to Edward Montchyk

As a member of the Naval Ordnance Laboratory staff from April, 1942, to the fall of 1944, Edward Montchyk has been awarded the Meritorious Civilian Service Award for his contributions to the war effort. Mr. Montchyk's citation reads "for noteworthy contributions in the development of successful and reliable mine sterilizing devices."

G. D. Edwards Returns from Washington

G. D. Edwards has returned to Bell Laboratories after service in Washington with the War Department since February, 1942, and as Executive Secretary of the Communications Sub-committee of the Technical Industrial Intelligence Committee since last March. Mr. Edwards, as Consultant to the Secretary of War, was in the Ordnance Department where he had a large part in the establishment of its control set-up. He then served for a period with the Signal Corps in a similar capacity. His last tour of duty in the War Department was with Army Service Forces Headquarters, where he was occupied with corresponding work for all the Technical Services of the Army.

News Notes

O. E. Buckley addressed officials of the Northwestern Bell Telephone Company at Omaha, Nebraska, on September 19 and later on the same day spoke on the work of the Laboratories at a luncheon meeting of Omaha businessmen. On September 20 and 21 Dr. Buckley attended a meeting of the National Inventors' Council at Pittsburgh. As part of the program, trips were made to some of the works of the U. S. Steel Corp. and to the laboratories of the Westinghouse Electric Company.

Dr. Buckley has been elected a member of the corporation of the Roscoe B. Jackson Memorial Laboratory which is located at Bar Harbor, Maine.

More Gas + More Traffic = More Accidents

F. B. Jewett was elected an Honorary Member of the American Institute of Electrical Engineers at the regular meeting of the Board of Directors held in New York on June 17. At the same meeting, which was also attended by D. A. Quarles, a member of the Board of Directors, S. B. Ingram was appointed to Sectional Committee C-60 which covers vacuum tubes for industrial purposes.

Electrical Engineering, September, 1945, carries a notice of John Mills' retirement and a short biography.

Anna Marshall was chairman of the servicemen's party given by the Syracuse University Alumnae Club on September 16 in New York City.

Statistical Methods in Quality Control. III Frequency Distribution for Setup Check of Process appears in the August *Electrical Engineering*. The article is one of a series prepared by the A.I.E.E. Sub-committee on Statistical Methods of which H. F. Dodge is a member.

Ralph Bown lectured at the Junior Camp of Stevens Institute of Technology at Johnsonburg, N. J., as one of a group of guest lecturers who described the work of their respective fields in order to help young men of high school and preparatory school age determine the vocation for which they are best fitted.

Beginnings of Nuclear Physics by K. K. Darrow appeared in the September issue of *Electrical Engineering*. The article contains the essential substance of an address delivered at the National Electronics Conference, Chicago, Ill., last year.

"Radah sez thar's revenoors a-comin', Luke. Cut loose the secret weapon"—One of "Doc" Tradup's war souvenirs

V. E. Legg presented a paper, *Optimum Air Gap for Various Magnetic Materials in Cores of Coils Subject to Superposed Direct Current*, in the Fall Technical Paper Program of the A.I.E.E. as one of a series of papers which normally would have been presented at the Pacific Coast technical meeting of the A.I.E.E.

October and November Service Anniversaries of Members of the Laboratories

45 years

G. B. Hamm

40 years

L. B. Stark
C. H. Wheeler

35 years

Raymond Calane
Philip Curran
Lloyd Espenschied
J. M. Finch
I. H. Henry
H. G. Rife

30 years

L. B. Eames

25 years

G. T. Anderson
I. W. Brown
May Brown
J. F. Busch
P. J. Doorly
A. D. Knowlton
N. L. Lamattina
J. W. McCaw
John Mogilski
J. B. Newsom
G. O. Pedersen
I. S. Rafuse
H. E. Rogers
William Wynn
S. J. Zammataro

20 years

C. P. Carlson
F. E. Dorlon
Adele Hoffman
A. N. Holden
Margaret Loesch
J. D. Maher
E. J. McCarthy
H. R. Moore
Tim Murphy
D. C. Tyrrell

15 years

L. P. Jackson
A. V. Lewis
R. H. Molloy
J. J. Moravec
W. H. Nelson
Anton Schmitz
W. H. Walker
F. W. White

10 years

Elizabeth Bell
V. P. Blefary
W. A. Blikken
Anna Fleckenstein
George Forshee
J. E. Hall, Jr.
Adolph Hanzl
W. E. McMahon
E. V. Paholek
M. J. Quinn
Theresa Rimassa
Annette Shanklin
A. V. Voinier
B. R. Wohld

IN THE SAME SERIES, *Judging Mica Quality Electrically* by K. G. COUTLEE is also offered as a paper for discussion by mail.

FRANK GRAY presented a paper, *The General Solution for an Electron Stream in a Parallel Plane Diode*, at the second annual meeting of the Division of Electron and Ion Optics at the American Physical Society meeting in Columbus, Ohio, last June.

G. T. KOHMAN, H. W. HERMANCE and C. F. HEFFT conferred on contact problems in Buffalo and Niagara Falls, N. Y.

L. EGERTON presented a joint paper with D. A. MCLEAN on *The Relation Between Capacitor Stabilization and Corrosion Inhibition* at the 1945 Corrosion Symposium at Gibson Island.

W. E. CAMPBELL attended the Corrosion Symposium at Gibson Island and visited the Naval Research Laboratories at Washington in connection with lubrication problems.

F. S. HIRD's article, *Wire Splice Detector*, appeared in the September *Electronics*.

K. K. DARROW spoke on *Atomic Transmutation and Its Consequences* before the A.I.E.E. Communications group, New York section, on October 16 in the Western Union Auditorium in New York City.

In Appreciation of His Efforts in WINNING WORLD WAR II

at the BELL TELEPHONE LABORATORIES

E. M. Mowton

is Hereby Certified to be a CHARTER MEMBER

of the

MAD BIRD AND MAD FISH CLUB

New York, September 14, 1945

SECRETARY PRESIDENT

CHARTER MEMBERS

A number of men loaned from Associated Companies have received "diplomas" from their Laboratories co-workers. Among them were the New York Telephone Company men G. L. Johnson and E. M. Mowton whose "diploma" is shown above

Bulldozers and road scrapers, grading the new parking lot south of the Murray Hill buildings, provide lunch hour entertainment for an interested technical audience

THE ROSTER of officers and committees of the American Institute of Electrical Engineers for 1945-46 includes the following: *Directors*, D. A. Quarles; *Board of Examiners*, H. M. Trueblood; *Standards* and *Constitution and By-laws*, R. L. Jones; *Edison Medal*, O. E. Buckley, D. A. Quarles; *Finance*, D. A. Quarles; *Members for Life Fund*, E. H. Colpitts (retired); *Membership*, E. G. D. Patterson; *Publication*, John Mills (retired); *Technical Program*, O. E. Buckley; *Basic Sciences*, M. J. Kelly, J. D. Tebo; *Communications*, H. A. Affel, S. B. Ingram and R. G. McCurdy; *Education*, G. B. Thomas; *Electronics*, S. B. Ingram, D. A. Quarles; *Instruments and Measurements*, D. A. Quarles; and *Radio Technical Planning Board*, H. A. Affel.

P. S. OLMSTEAD, Chairman of the Committee on Development of the Institute of Mathematical Statistics, held a meeting of his committee at Rutgers University prior to the regular session of the Institute. He also attended an executive committee meeting of the Princeton Engineering Society.

J. GRAMELS and J. G. WHYTOCK discussed selenium rectifiers at the Lynn plant of the General Electric Company.

W. O. BAKER was in Washington at the Bureau of Standards and at the Rubber Reserve Co. on synthetic rubber research.

G. DEEG, F. S. CORSO and H. F. HOPKINS studied sound diaphragm problems at the Hawley Products Co., Illinois.

AT HAWTHORNE, recently, the problems of formulating a black baking enamel designed for infra-red baking were discussed by J. C. OSTEN, C. C. HIPKINS and K. G. COMPTON.

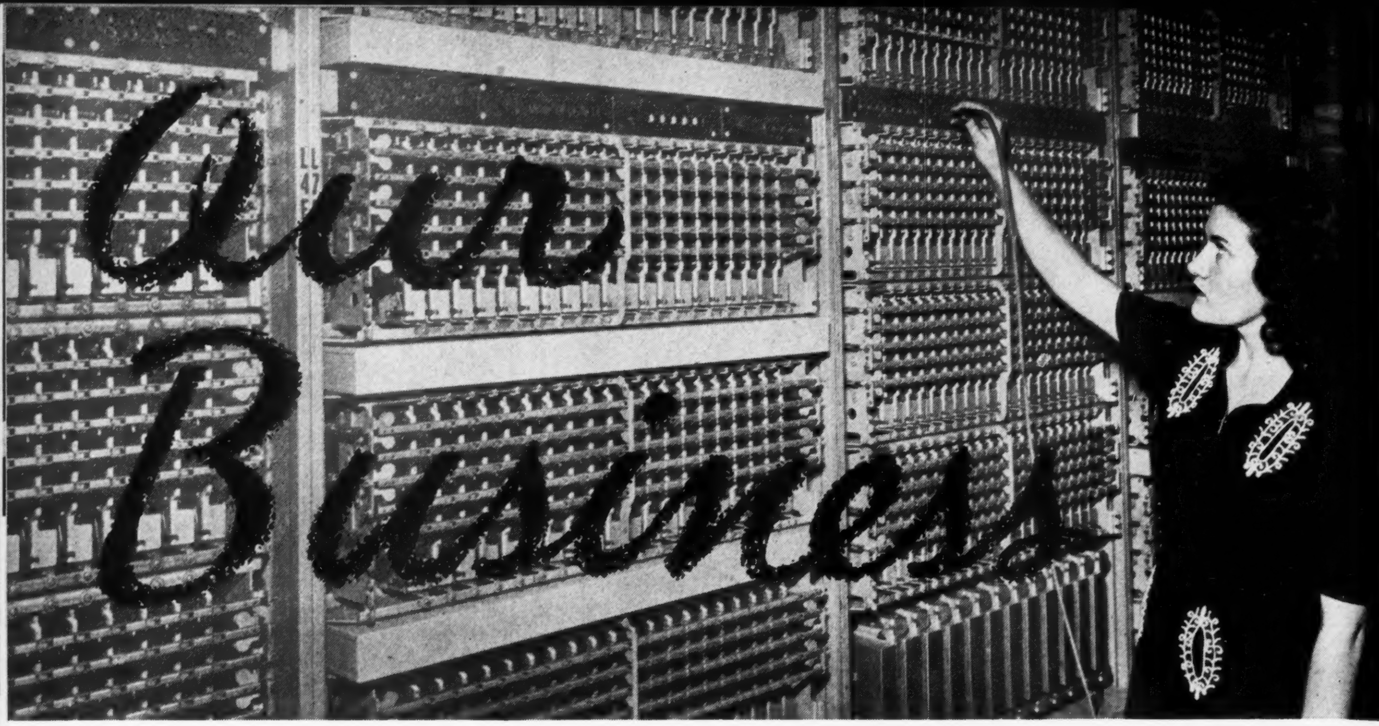
John J. Zander of Murray Hill displays Philippino handicraft sent to him by his son, Lieut. Edmund Zander of the AAF

C. D. HOCKER and R. J. NOSSAMAN attended the regional outside plant engineering conference held recently in Chicago.

W. H. S. YOURY at Providence discussed cotton sleeving and prepared cotton sleeves with the Providence Braid Company and the Hope Webbing Company.

During the Months of July, August and September, the United States Patent Office Issued Patents on Applications Previously Filed by the Following Members of the Laboratories

G. E. Atkins	H. Eckardt	W. P. Mason (2)	R. K. Potter
W. M. Bacon	W. A. Edson	R. F. Massonneau	N. Y. Priessman
C. I. Baker (2)	J. W. Emling	R. C. Mathes	C. S. Rhoads
C. C. Barber	C. E. Fay	B. McKim	R. H. Ricker
W. L. Bond	J. W. Foley	O. R. Miller	V. L. Ronci
D. E. Branson	R. V. L. Hartley	D. Mitchell	O. A. Shann
H. A. Burgess	R. E. Hersey	E. R. Morton	E. A. Thurber
J. A. Carr	W. H. T. Holden	O. Myers	K. G. Van Wynen
A. B. Clark	H. F. Hopkins	E. A. Nesbitt (6)	A. Weaver
J. E. Clark	S. B. Ingram	R. D. Parker	C. A. Webber
L. R. Cox	J. A. Krecek	K. W. Pfleger (2)	J. W. West
J. R. Davey	B. Leuvelink	L. F. Porter	L. A. Wooten
A. R. D'Heedene			



ELEANOR WOLFE

A WAR TRAINING COURSE in radio taken before graduation from James Monroe High School, the Bronx, decided ELEANOR WOLFE upon seeking technical work. The course, given by the Maritime Trade Center, plus the training she received in wiring and blueprint reading in the Laboratories TA training course, fitted Miss Wolfe for work in the wiring group of the Systems Development Switching Laboratory. She came here a little over two years ago for work on wiring on war jobs, but now she is engaged on a new important telephone development, the crossbar automatic message accounting system. She learned to lay out and plan local cables, and to run, sew and solder wires of these cables to relays and other apparatus on laboratory test frames. Her picture above shows Miss Wolfe checking wiring changes on the complete system in the switching laboratory. An outdoor girl, she enjoys sailing on Pelham Bay near her home, skating, basketball, and dancing.

* * * * *

HELEN RACZ, as secretary to the Transmission Engineer, P. W. BLYE, has felt the pendulum of her work swinging decidedly from war projects to peacetime activities including the development of rural power-line telephony. The problem of furnishing telephone service to farming communities by means of power-line carrier was being carried forward at the Laboratories when the more urgent problems of war caused the work to be interrupted and slowed down. With the war over, Miss Racz's work for the most part relates to this problem.

Coming to the A T & T, after graduating from Julia Richman High School, Miss Racz continued to study evenings at Hunter College as she advanced first to the Personnel and then to the Development and Research Departments. When in 1934 the merger of the D and R with the Laboratories was made, she worked as a stenographer for a time before being assigned to the Personnel Department as secretary to the Assistant Secretary of the Benefit Committee, a position which she held for five years before being transferred to her present assignment in Transmission Engineering. Here in New York where she lives, Miss Racz is active in

Jean Whorley of Murray Hill operated this PBX during the renegotiation show

This is Helen Racz, a secretary in the Transmission Development Department

church and choir work, but for as much of the year as possible she goes out to a little house she bought near Peconic Bay, Southampton, where she enjoys fishing, boating and beach barbecues with her friends.

* * * * *

If an engineering career at Bell Laboratories is a girl's ambition, it can be achieved here with a high school diploma and determination as stepping stones. Marie Kummer has done it. Starting as a mail girl at West Street, she began studying evenings at Brooklyn College and meanwhile was promoted to the Protection Development Department where she analyzed oscillograms of power interferences. When the war came she was transferred to the Systems Development Department to engage in repeater measurement work, particularly performance measurements on coaxial amplifiers and regulators. She has also done quality control work in connection with new productions and has studied the results coming in from the field. Miss Kummer made her first field trip to Minneapolis, Minn., for the field trial of new office equalizers for the L1 coaxial system. Now that the war is over, she has gone back to evening college to get her degree. She had studied six years at night before overtime on war work interfered, yet she has kept an interest in such activities as the Lutheran League and the American Cryptanalysis Association which she joined after completing a course in cryptanalysis, her cryptanym being *One of Two*, because she has a twin brother.

Catherine C. Maull of the Personnel Department was retired at her own request on October 1

Marie Kummer makes measurements to secure data for equalizing coaxial cable

Capitola Dickerson has been doing research on ceramics in the Chemical Laboratory at Murray Hill. Miss Dickerson began work in the Ceramic Department in 1943 when she joined the Laboratories. Now she does research on new compositions and processes in the ceramic field by making base compositions from clay and by forming them into ceramic pieces of very precise dimensions and perfection to be used for new telephone developments or in some instances for Government contracts which are still outstanding.

As pianist of the Laboratories Choral Club at Murray Hill, Miss Dickerson brought a wealth of musical experience and training to the group. In addition to having studied liberal arts at New York University and musicianship at Teachers' Training School, she had been the recipient of a scholarship course at the Juillard School of Music, the award having been made by the community of Summit. She had been a choir director and musical director for Y.W.C.A. camps and conferences. Miss Dickerson is a resident of Summit and is active in many community and interracial activities.

* * * * *

Alice Kavanagh has recently become assistant supervisor of the Transcription Department at the Graybar-Varick building where she assists in the assignment of telephone dictation, typing and stenographic work and in the checking of finished assignments. Prior to her transfer, Miss Kavanagh had been at West Street where she had specialized for a long time in typing which required the use of Greek equations and where she had assisted in the supervision of part-time typists who have worked in the Transcription Department from six to ten in the evenings since the volume of war work in that department became too heavy to handle entirely during regular hours.

After graduating from Cathedral High School she had worked for the Navy before joining the Western Electric Engineering Department. Her home is at Belle Harbor where Miss Kavanagh enjoys the beach and water during the summer months and gardening during the spring and fall.

* * * * *

In the dark room of the Photographic Department Peggy Monahan's work in part is the preparation of negatives prior to their being printed. In addition to retouching and blocking out material on them, she titles the negatives, sorts photographic orders, readies them for delivery and does clerical work incidental to keeping the flow of photographic orders running smoothly. Peggy joined the Laboratories after graduation from Textile High School in 1943 and in six months was promoted to her present position. Despite the fact that she is a native

Alice Kavanagh

Capitola Dickerson is shown cutting ceramic tubes on the diamond cutting machine

Marjorie Forrest talks to a supplier regarding ration points to cover purchase

New Yorker, a Villager in fact, she prefers hiking to all other sports and thinks nothing of walking a hundred blocks just to keep in trim. For amusement Peggy likes bowling, square dancing on the Mall at Central Park and good movies.

* * * * *

A MILLION AND A QUARTER ration points were carefully accounted for and applied to the problem of providing meals for Labora-

PEGGY MONAHAN

tories members at Murray Hill by MARJORIE FORREST, supervisor of their restaurant. To this was added the problem of maintaining an adequate staff to serve fifteen hundred patrons daily despite the lack of help in suburban areas and the curtailment of traveling facilities. Yet, with all the problems in which restaurant management was involved during wartime, Miss Forrest has enjoyed Murray Hill and has established herself in the community by acquiring her own apartment in nearby Maplewood. Her previous experience after having completed her training in dietetics has including managing the Hornby House Tea Room in her home town, Greene, New York, and being assistant manager for the Helen Kinnaird Restaurant in New York City—training which stood her in good stead at Murray Hill.

With the exception of a younger sister at college and herself, the Forrest family is all in uniform; her father and brother are stationed at Pacific naval bases a few miles apart and her sister is an Army nurse. Miss Forrest's interests are her apartment, sewing and knitting, at which she is proficient, and traveling on vacations to the West—she originally came from Brandt, South Dakota. Week-ends she frequently spends in New York where she does the theaters, shopping and things of current interest, or else spends the time with school friends in the city.

Engagements

*Charles A. Charity—Evelyn Salter
*James De Laura—Theresa Ricigliano
Lt. Frank H. Hunter, U.S.N.R.—*Monica Armstrong
Capt. George A. Roeder, U.S.M.C.—*Anne Connor
*Raymond S. Yerden, U.S.M.C.—*Carolyn C. Mullaly

Weddings

*Herbert S. Arnold—*Miriam Pearce
John R. Bonsiewich—*Elizabeth Mraz
Lt. Joseph Connor, U.S.A.—*Carole Finch, U.S.N.
*Herbert C. DeValve—Audrey Lewis
*Robert E. Foote—Edna Killpatrick
*Donald J. Gagne—Rita Shannon
Leo P. Gates, U.S.A.—*Ann Ashton
*Roger W. McKenzie—Mabel Simpson
*R. D. Wylie—*Edwina Hazen
Lt. Saylor Zimmerman, U.S.A.—*Mary Ellen Wertz

*Members of the Laboratories. Notices of engagements and weddings should be given to Mrs. Helen McLoughlin, Room 803C, 14th Street, Extension 296.

Dolls and Toys for Needy Girls and Boys

At Christmastime sick and underprivileged children in the metropolitan New York and New Jersey areas will receive dolls dressed by Laboratories' girls and other toys—gifts made possible by the donations of the members of Bell Telephone Laboratories. The Doll and Toy Committees at West Street, Murray Hill, and Whippany, functioning independently through Bell Laboratories Club, have taken up the collections, bought toys and dolls, and distributed the dolls to be dressed. Early next month displays will be arranged in the New York and Murray Hill auditoriums and in the lounge at Whippany so that contributors to the fund will be able to see what their money did. Mrs. Tene Sullivan, Second Vice-President of the Club, is chairman of the New York Committee, Mrs. Gladys Sanderson is Murray Hill chairman, and Mrs. Harriet Filmer, the chairman at Whippany.

Members of the Laboratories at all locations who still wish to contribute to funds for the Doll and Toy Committee may do so by contacting their club representatives or the chairmen of the committees at the various locations.

How to Write a Five-Minute Furlough

Even though the war has ended, there are and will be thousands of servicemen and women overseas for some time to come. It becomes increasingly important to their morale that they continue to receive frequent letters and good ones. The Women's Advertising Club of Cleveland has issued a pamphlet on writing a five-minute furlough which suggests writing cheerful newsy notes telling of everyday happenings, and writing them often. It also suggests addressing an envelope to the serviceman and keeping it ready to mail in a desk drawer, pocket or a handbag. Into this envelope they suggest that one enclose clippings of cartoons, book reviews and sport sections of newspapers.

Whippany-Murray Hill Tennis Tournament

The second inter-laboratory tennis match between the Whippany and Murray Hill Laboratories was held on September 22 at the municipal tennis courts, Morristown, N. J., Murray Hill team won five matches to Whippany's two. The results of the individual matches follow:

Winner	*Location*	*Loser*	*Score*
V. T. Wallder	M.H.	G. E. Hadley	6-2, 4-6, 6-4
W. G. Pfann	M.H.	J. C. Crowley	3-6, 7-5, 6-3
Mrs. E. M. Engleman	Whip.	Miss M. M. Hoogstraat	2-6, 6-4, 6-3
Miss G. M. Schwarz	Whip.	Miss L. W. Yawger	6-2, 6-3
V. H. Baillard and J. F. Barry	M.H.	W. L. Cowperthwait and G. B. Troussoff	6-1, 6-4
Miss M. A. Sampson and Miss P. E. Nimmo	M.H.	Miss G. A. Mansfield and Miss J. Cramer	2-6, 6-1, 7-5
Miss E. Crowley and R. N. Larson	M.H.	Miss V. R. Smith and S. E. Hardaway	6-2, 7-5

News Notes

UPON INVITATION of the Combined Production and Resources Board to be a U. S. delegate, E. C. ERICKSON attended the American, British, and Canadian Conference on *Unification of Engineering Standards* at Ottawa, Canada, from Sept. 25 to Oct. 5.

AT THE WESTERN division of the New England Telephone and Telegraph Co., C. H. AMADON studied the practical application of ground line treatment to northern white cedar poles.

R. H. COLLEY observed the production and pressure treatment of jack pine poles at Port Arthur, Ontario. Mr. Colley, as chairman, and Mr. Amadon attended a meeting in Minneapolis, under the auspices of the American Standards Association, of a special War Standard Committee on poles made from miscellaneous conifers.

J. A. CARR went to Menominee, Michigan, to study new methods of transposing wires.

Please put your RECORD in the "Correspondence-Out" box when you are through with it so that it can be sent to a Serviceman's family.

F. V. HASKELL visited the Owens-Illinois Glass Co., at Muncie, Indiana, to discuss a new design of open wire line insulator.

M. D. RIGTERINK, D. A. MCLEAN, L. EGERTON and G. T. KOHMAN were at the Ceramics Laboratory of the E. I. duPont Company for the demonstration of a new process of producing ceramic capacitors.

R. A. SYKES and G. M. THURSTON discussed with the Naval Research Laboratories at Washington the application of crystals to some Navy developments. Mr. Thurston also reviewed with the Aircraft

Among the participants in the Murray Hill-Whippany Tennis Tournament were G. E. Hadley, shown alone at the left, and Gertrude Schwarz, at the right. In the top center photograph are Erica Crowley and R. N. Larson shaking hands with Violet Smith and S. E. Hardaway; below are Geraldine Mansfield, Jean Cramer, Phyllis Nimmo and Marjorie Sampson

Radio Laboratories at Dayton the specifications for the CR-9 type crystal.

S. B. INGRAM has been appointed chairman of the *Gas Tubes* committee of the Joint Electron Tube Engineering Council, cooperatively sponsored by the R.M.A. and the NEMA.

W. G. SCHAER visited Washington, D. C., in connection with special toll problems.

H. H. SPENCER and G. W. MESZAROS were at the Baldwin, Wisconsin, repeater station for "L" carrier equipment trials.

AT THE Bell Telephone Company, Philadelphia, Pennsylvania, and at General Motors Corp., Detroit, Michigan, V. T. CALLAHAN was concerned with diesel engine problems; at the New England Telephone and Telegraph Co., Boston, he discussed gasoline engines.

H. A. BIRDSALL and B. L. CLARKE attended the N.D.R.C. Committee Meeting at Cambridge during September.

Obituaries

ALAN HOBBS, in charge of the order service group at Whippany, died on September 24 while on vacation in Quebec. Mr. Hobbs joined the Laboratories in 1918 and until 1928 was in the disbursements group of the General Accounting Department. He then transferred to Electrical Research Products where he was engaged in similar work. Upon his return to West Street he was in the accounting group until 1941 when he transferred to the laboratory and stockroom order service group of General Service.

PATRICK FINN
1912-1945

S. H. LAFONTAINE
1898-1945

MAY QUINN
1882-1945

ALAN HOBBS
1890-1945

MAY QUINN, formerly a clerical Supervisor of the General Service Department, died on September 26. She had been retired in 1941 after thirty-three years of service. Miss Quinn joined the New York Telephone Company in 1908 and four years later transferred to A T & T on a temporary basis to supervise a group of girls working on rate charts. After that work was completed she joined the chief clerk's office of the Engineering Department where she did clerical work and was in charge of miscellaneous services. In 1919, with the formation of the D and R, she continued with the same type of work and when in 1934 that department merged with the Laboratories, she was placed in charge of a messenger service group in the General Service Department.

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PATRICK FINN of the Plant Operation Department died on October 4. Mr. Finn joined the Laboratories in 1937 as a cleaner and then became a patrol watchman. Previous to his death he was a porter in the West Street building.

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SAMUEL H. LAFONTAINE, a member of the Laboratories Staff who had been on a disability leave of absence since last December, died on October 6. Mr. LaFontaine joined the Commercial Relations Department of the Laboratories early in 1943 and was engaged in handling the commercial phases of Office of Scientific Research and Development projects.

VICTORY LOAN

The boys are coming home, but there are still many responsibilities for us after their great victory. Your money is needed—so now for the last time,

BUY

VICTORY BONDS

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